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ABSTRACT

A study examined the emerging skill needs in the Wisconsin printing industry, a key industry that provided the largest increase (more than 13,000 new jobs) in manufacturing employment in the state in the past decade. Eighteen interviews were conducted with industry personnel and production managers, union representatives, technical college instructors, and industry-affiliated associations; and a mail survey was administered to a random sample of 232 printing firms throughout the state (with 89 questionnaires returned) to gather information related to industrial structure, skill needs, and training activity. The study found that printing firms are facing strong pressures to adopt new computer-based technologies, to speed up work, and to create higher quality work. As a result, skill requirements have increased for production workers. The supply of skilled labor was seen as inadequate, and in-house training programs for workers ranged from none to elaborate efforts. The following recommendations were made to address the emerging skill needs of the Wisconsin printing industry: (1) expand enrollments in graphic arts programs in technical colleges; (2) institute cooperative training programs; (3) focus on providing high-level general occupational training; (4) focus on meeting the needs of medium-sized full-service printers and trade shops; (5) implement more extensive faculty internship programs; (6) make better use of innovations in training technologies, existing resources, and training programs; and (7) appoint a central advisory committee to coordinate curricular decisions. (The report includes 30 tables, a bibliography listing 47 references, and appendixes containing study methodology, wage rates in the printing industry, and a glossary.) (KC)

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20-105-150-291 Sectoral Needs Assessments: Emerging Skill Needs in the Printing & Publishing Industry

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SKILL NEEDS AND TRAINING STRATEGIES IN THE WISCONSIN PRINTING INDUSTRY

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A report prepared by the

CENTER ON WISCONSIN STRATEGY*

March 1992

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Preface

Work for this report was carried out under a grant from the Wisconsin Board for Vocational, Technical and Adult Education (VTAE). The project was directed by Joel Rogers and Wolfgang Streeck. Stephanie Luce and Barbara Wootton did the research and wrote the largest part of the report. Greg Jackson and Josh Whitford provided technical assistance at various stages of the project.

Madison, Wisconsin February 1992

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Executive Summary

This report, commissioned by the Wisconsin Board of Vocational, Technical, and Adult Education, and written by the Center on Wisconsin Strategy, examines the emerging skill needs in the Wisconsin printing industry. Printing is of great importance to the Wisconsin economy. Over the past decade, the printing industry provided the largest increase in employment of all manufacturing industries in the state -- more than 13,000 new jobs. Approximately 8,000 new jobs are expected to be added by the year 2000.

The printing industry is highly diverse. Firms vary in size, product markets, level and use of advanced technology, work organization, perceived skill needs, and training strategies. Despite the diversity, firms of all types are facing increased competition, rapid technological change, and more sophisticated customer demands are creating pressures to change the organization of work and production. New skills are required of workers to meet these competitive pressures.

Interviews were conducted with industry personnel and production managers, union representatives, technical college instructors, and industry-affiliated associations; and a mail survey was administered to printing firms throughout the state to gather information related to industrial structure, skill needs, and training activity. The findings of this study provide the basis for recommendations to the technical college system for designing training curriculum and program delivery for the industry, to meet better the needs of Wisconsin firms and their employees.

Summary of Major Findings

Printing firms are facing strong pressures to adopt new computer-based technologies, to reduce turnaround time for jobs, and to respond to customer demands for increasingly differentiated and higher quality products. As a result, cutting edge firms are moving towards new forms of work organization that require greater flexibility, responsibility, communication, and team work among workers. Employees need organizational and industry knowledge and the interpersonal skills that enable them to interact effectively with both customers and co-workers. At the same time, traditional printing skills and an understanding of the printing process and the industry are as important now as ever.

Study results indicate that, in general, skill requirements have increased for production workers: Two-thirds of survey respondents indicated that, over the past five years, skill requirements had increased in the pre-press and press areas, and one-third indicated that they had increased for bindery workers.

The supply of skilled labor is widely seen as inadequate. More than half of responding firms indicated that they had difficulty in hiring sufficiently skilled workers. Employers' views were highly contradictory in terms of the *types* of skills they required and their level of

satisfaction with the existing skill supply. The majority of firms indicated a strong demand for basic, attitudinal, and foundational (the ability to learn) skills, while industry-specific technical skills ranked lower. However, those firms that required higher order general-occupational and specific technical skills -- leading-edge trade shops and medium-sized full-service printers -- were, on average, the least satisfied with the skill supply.

Firm training strategies are similarly diverse, ranging from elaborate in-house programs to nothing at all. More often than not, training is reactive and firm-specific, designed to fill narrowly-defined skill gaps on a short-term, ad hoc basis. Traditional apprenticeship has declined and little else has emerged in the area of general occupational preparation, although some firms do provide in-house "apprenticeship" training sequences to their new employees. In the long run, this does not bode well for the industry as narrow skills inhibit the flexibility and mobility of labor necessary to adjust to a rapidly changing environment.

Only a small proportion of Wisconsin's printing workforce are graduates of technical colleges. While firms generally are not dissatisfied with technical college graduates, they are not overly enthusiastic either. Given the industry's diversity in terms of work organization and skill needs, it is not surprising that the reasons for complaints show the same degree of variation. However, one common complaint about technical college system graduates is their lack of "real world", practical work experience that is necessary for workers to effectively transfer skills from the classroom to the shop floor.

Summary of Major Recommendations

To help address the emerging skill needs of the Wisconsin printing industry, we recommend to the WBVTAE the following:

- **Expand enrollments in graphic arts programs**. Although the technical college system will never provide more than a small proportion of the printing industry's skilled workforce, given the size and importance of the industry to the state, such expansion would appear to be an excellent investment.

- **Institute cooperative training programs**. Through technical college and firm sponsored programs, students can combine practical work experience in a variety of settings with their school-based training.

- **Focus on providing high-level general occupational training**. Rather than increasingly providing the short-term, customized training that many firms seem to desire, the technical college system should retain the depth and breadth of its current programs to ensure workers and employers the capacity to adapt to the unpredictabilities of technical change and growing competition.

- **Focus on meeting the needs of medium sized full-service printers and trade**

shops. While firms of all types are facing new skill needs, these firms have the highest skill demands for entry-level workers, particularly general occupational and specific technical skills. These firms are also the least satisfied with the skills supply and have fewer training resources due to their size.

o **Implement more extensive faculty internship programs**. Internships would help faculty members keep abreast of current practice and technology in the industry, as well as help industry stay attune with technical college programs.

o **Make better use of innovations in training technologies, existing resources and training programs**. Training programs that successfully address particular needs of industry include self-paced computer-based tutorials; the WorkPLACE program, developed jointly by the National Association of Printers and Lithographers and the Carl Didde Corporation; and the Graphic Arts Institute in Milwaukee.

o **Appoint a central advisory committee to centrally coordinate curricular decisions**. This committee -- representing firms of all types and the industry's major trade unions and trade associations -- would defend the technical college's programmatic integrity and help relieve pressures on local districts to comply with the wishes of individual employers.

Introduction

This project studied emerging skill needs in the Wisconsin printing industry. The project began in September 1990 with a review of national and state data, secondary sources, and industry literature. In November and December of 1990 exploratory interviews were conducted with firms, technical college system educators, and employer association and union representatives to get a sense of the industry, including trends in training, skill needs, and technology. In January through April 1991, further interviews were conducted, focusing on training, skill formation, and firms' relations with the technical college system. In February through May 1991 a mail survey was administered to printers throughout the state (see Appendix I).

This report is based on information gathered from the interviews, questionnaires, and secondary data and literature. All responses gathered directly from firms, either through interviews or the mail survey, were treated in a confidential manner. Any quotes or data presented in this report which identify a particular firm were taken from public documents. All other information is presented in a way that preserves the anonymity of the respondent.

1. Industry

The printing industry emerged in Wisconsin in the early 1800s, and today it is one of the state's most important industries in terms of employment and sales. The printing and publishing sector is the fourth largest manufacturing employer, employing 45,182 people in 1989. This sector had the largest absolute increase in employment among all manufacturing industries in the state between 1982 and 1989 -- an increase of 12,670 workers, or 39 percent (see Table 1-1) (Wisconsin Labor Market Information, 1990).

Wisconsin is a strong competitor in national printing markets. Statistics from the Printing Industries of America (PIA), a national employers' association, indicate that Wisconsin is fourth among the states in printing intensity, and Wisconsin's printing growth is estimated at twice the national average (PIA, 1990). A Forward Wisconsin report (1989) cites a good transportation system, quality workforce, location central to major population and manufacturing centers, and proximity to the nation's top paper manufacturing area as key factors in the state's success in printing. The state's value of printing shipments is estimated at $2,551 million for 1989 and was projected to grow 5.5 percent in 1990 (Johnston, 1990).

1.1. Industry definition

The first task of the study was to define the printing industry.[1] Some definitions classify

[1]Although the original plan was to study printing and publishing, the project focused on printing only for the following reasons: As employment figures indicate, it is printing rather than publishing that has contributed to the greatest employment growth in the state. Also, these two sectors have distinctly different staffing patterns --

Table 1-1.
Wisconsin employment in printing and publishing (SIC 27)

	Two- and three-digit SIC code	Average employment 1982	Average employment 1989	Absolute change	Percent change
27	Printing & publishing	32,512	45,182	12,670	39.0%
271	Newspapers	10,570	12,393	1,823	17.2%
272	Periodicals	1,463	1,598	135	9.4%
273	Books	2,983	3,529	546	18.3%
274	Misc. publishing	1,400	2,264	864	61.7%
275	Commercial printing	13,032	21,118	8,086	62.0%
276	Business forms	1,368	1,521	153	11.1%
277	Greeting cards	*	*	*	*
278	Blankbooks and bookbinding	659	702	43	6.5%
279	Printing trade services	1,032	2,057	1,029	99.7%

Source: Statewide Total from Covered Employment and Wages series.

* SIC 277 figures not given separately or in total, for confidentiality reasons.

printers by products, others, by process. In either case, as product markets and printing processes change over time, it becomes more and more difficult to define the boundaries of the industry. Printing and publishing is considered to be one industry at the two-digit Standard Industrial Classification (SIC) level -- SIC 27. However, this classification incorporates a wide range of firm types that are not necessarily printers, such as book publishers, and it excludes many establishments that can be considered part of the printing industry, such as quick-printers, which are classified as service establishments.

A further complication lies in the determination and classification of in-plant shops, which are printing operations that are part of larger (nonprinting) firms. In-plant shops are common in large firms, particularly in firms where privacy of documents is important, such as insurance agencies; where printed products are part of the total product, such as direct marketers; and where printing is a closely related industry to the primary industry, such as paper converters and packagers.

A final difficulty exists in defining particular firms where more than one type of printing process is used. For example, a printer may incorporate various methods, such as lithography and flexography, to print a variety of products.[2]

After conducting exploratory interviews, it became clear that no concrete definition could be applied to the printing industry. Therefore, it was decided to focus the study on firms whose primary function was either commercial printing or part of the commercial printing process (trade shops), since these sectors account for the largest number of firms and employees in the State, as well as the largest share of growth. Firms classified as commercial printers most commonly use lithography, although some use flexography, gravure and screen printing to print products ranging from letterhead, business cards, and pamphlets to textbooks, periodicals, and trade journals. Firms classified as trade shops primarily perform pre-press processes such as typesetting, color separations, and image assembly.

Some non-commercial printers, quick printers, and in-plant printers were also included in the study, since the training needs of some of these firms are closely related to those of the commercial printing sector. Initial interviews indicated that newspaper sector should not be included with commercial printing, due to its different products, markets, and training and skilling needs (see Appendix I for more information on survey sample).

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production workers comprise about 16 percent of publishing employment, compared to over 60 percent in printing. Thus, to better obtain a community of interest around training issues, the project focused on printing only.

[2]This confusion regarding definitions was visible in the survey responses. When asked to define themselves as either commercial, quick, trade shop, or other, several respondents checked more than one box. Also, some respondents producing the same products with similar processes defined themselves differently.

1.2. Product markets and production strategies

Forces of change for printers of all sizes include more competitive markets, new technology, stricter environmental regulation, and a more slowly growing labor force. Markets, while still growing, are expanding more slowly due to slower overall U.S. economic growth in the past few years, increasing competition from nonprint media in advertising and business communications, and the expansion of nontraditional, non-impact printing technologies. However, fears that the electronic media and the proliferation of personal computers and desktop publishing systems would seriously undercut the market for printed materials appear to be unfounded. Ironically, the advent of personal computers and sophisticated office machines has actually helped fuel the growth of printing in higher quality and color products, as people now expect more on paper and expect it to look better. Also, sophisticated new technology has increased the diversity and quality of products offered, further stimulating demand for printed material (Eckhardt, 1989; Printing Industries of America, 1990; Scott, 1987; Interviews). Jack Hayes, president of Printing Industries of Wisconsin (PIW), a trade association, commented that "people will thumb through magazines and before the next page all but expect to be dazzled by color and clarity" (1987).

Commercial printers' customers have become more sophisticated and demanding because they face a more complex, competitive business environment. Customers with access to computer technology have become more involved on the front end of production, performing certain typesetting and pre-press functions in-house and creating the need for appropriate interfaces between clients' and printers' software and equipment. Printers increasingly invest in high-speed communications equipment, such as facsimile machines, to allow transmission of files and copy between vendors and clients (PIA, 1989).

As printers' customers face more fragmented markets, products work has become increasingly specialized (e.g., niche market magazines, targeted advertising, and specialized product wrappings). All market segments face an increasing demand for faster turnaround, shorter runs, and more customized products. One interviewee said that the customers want more "bells and whistles," particularly in binding (Interview). Customers now want special editions, bound with hard covers, pockets, inserts, etc. (PIA, 1989; Interviews). Greater digitization and automation of equipment has provided printers with the capability to do more color and quality work and to produce smaller batches more efficiently.

"Niche printing" has become a favorite catch phrase in the industry. Specialization and a deeper involvement with customers are seen as the keys to success by industry leaders. Harry V. Quadracci, president of Quad/Graphics, Pewaukee, commented in Graphic Arts Monthly (January, 1990):

> High quality, service, and delivery are the norm. The 'new sizzle' lies in 'high tech/high touch'. When every printer has the same technology -- that is, high technology -- then the high touch, the ability to use the technology better and to anticipate the changes our clients face, makes the difference. With clients'

> technological, cost, and competitive situation changing so rapidly . . . the new concern of printers goes beyond what the client is printing and binding today to what the client should be doing tomorrow. The printer's role is changing from that of a supplier to a consultant . . . to understand the customer's business and develop answers to problems before they occur.

Leadership in technology, along with a willingness to seek, train, and retain the 'best' people are seen as the keys to success in the targeted, 'value-added' market (Karol, 1990).

Aggressive marketing is a relatively recent phenomenon among printers, becoming legitimate over the past decade as service and "bonding" with customers has become increasingly important. Customer service representatives need to be familiar with technical processes and capabilities (Gorelick, 1990). One Wisconsin printer holds customer forums to better gauge their clients' needs. Whereas five years ago this printer had no designated sales force, taking most orders over the phone, they now have four individuals involved in sales, establishing personal contact with most of their customers (Interview). Another Wisconsin firm provides their customers with detailed information in notebooks, tours, and presentations to educate them about processes and the firm's capabilities.

Large successful printers say they must continually upgrade their equipment to keep customers satisfied and to remain efficient.[3] According to a July, 1989 Milwaukee Journal article, Quad/Graphics spent over $50 million a year over the last five years for equipment. Aurand, the Chairman and CEO of Banta Corporation, was quoted as saying: "If you're going to stay up, you've got to be willing to invest in new equipment constantly." Banta spent $40 million on capital investment in 1988 and was expected to spend between $40 and $50 million in 1989 (Fauber, 1989). Perry Printing Corporation recently invested $6.5 million in an eight-unit Harris press at its Baraboo plant to meet the increasing trend of catalog and commercial customers to convert to smaller trim sizes in anticipation of postal costs increases in 1991. State-of-the-art technology -- computer-based design, electronic pagination systems, and color laser scanners -- allows Wisconsin trade shops like National Colorite Corporation of New Berlin, Scan Graphics in Brookfield, and Four Lakes and Widen Colourgraphics in Madison, the flexibility to succeed in the high-quality pre-press and color separation market. They succeed by carving out specialized niches in services provided to regional and national customers (Murphy, 1990).

In addition to customer orientation and niche market strategies, selective acquisition is another strategy pursued by state printing firms. The Banta Corporation of Menasha bought Beddor Companies Inc., a Minneapolis-based group of five printing firms in 1988, boosting company sales by 60 percent and putting Banta among the five largest commercial printers in

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[3]In 1989, the printing and publishing industry spent $67,230,000 in capital investments, which accounted for 9.1 percent of all capital investments in Wisconsin. This was the third highest rate: Paper and allied products made up 41.4 percent, and machinery except electrical accounted for 11.4 percent (Wisconsin Department of Development, 1990).

the nation. Banta made this acquisition in order to acquire new markets, according to CEO Aurand: "[The] benefits of being part of a larger organization are clear. Owning an increasing number of subsidiaries permits referring of customers from one to another . . . cross-selling to satisfy diverse customer needs" (Fauber, 1989; Karol, 1990).

As markets have become more competitive, growth has slowed, and capital improvements have become increasingly expensive, there has been a trend toward mergers among larger printers. Acquisition of faster, automated technology has led to overcapacity in the industry (in the summer of 1989, the industry was estimated to be operating at only 80 percent of capacity), furthering the trend toward consolidation. For example, family-owned Moebius Printing Co. in Milwaukee, a commercial printer with sales of about $75 million, was bought out by a group of investors including Michael C. McDonnough, a British publisher, in 1987. The firm was merged with Desaulniers Printing Co., of Milan, Illinois, a firm with sales of around $26 million, because according to McDonnough, "You have to be a certain size to do certain things." The biggest Wisconsin deal was W.A. Krueger's agreement to a friendly $321 million buy-out by Ringier AG, of Zurich, Switzerland. Krueger had moved its headquarters from Brookfield to Phoenix in 1975, but maintained a large portion of its operations in Milwaukee. Bayer, a vice president at the new Ringier, said the high capital costs of modern day printing forced Krueger to accept the merger (Fauber, 1989).

As new technology has provided larger firms the capability to do specialized, shorter-run printing, middle-sized regional printers are pressured as larger firms seek to fully utilize their new capacity. Under-capitalization inhibits these mid-sized firms from making investments in the latest technology. The outlook is for consolidation or elimination of the less competitive firms (PIA, 1989). One way that regional firms have sought to cope with these pressures is through extreme specialization and associative action whereby each firm "does jobs that are strictly [their] forte" and refers or subcontracts other jobs (Interview).

Small commercial printers are being pressured from below. The distinction between quick-print and small commercial shops is eroding in the low-end, short-run market. Quick printers are upgrading and expanding services beyond black and white copying to provide desktop publishing, four-color printing, color copying, and facsimile transmission. Some see a new market segment emerging of "business printers", providing one-stop shopping for document creation to pre-press graphics to finishing. In-plant and quick printers are benefitting from new inexpensive technology designed for them -- platemaking; desktop publishing; offset duplicating; and integrated computer centers to handle estimation, tracking, inventory, accounting, and work scheduling (Peterson, 1990). Whereas in early 1970s there were only three quick-print firms in Milwaukee area, today there are some 150 shops (Fauber, 1989).

Another strategy that firms use to cope with competitive pressures and shorter turnaround time is subcontracting. While some printers have integrated vertically and absorbed their subcontractors to reduce uncertainty, others that have consistent relationships do not find this to be necessary. For example, some firms have longstanding relationships with subcontractors

for entire stages of the process, commonly color separations and binding. Some firms subcontract up to several million dollars worth of business each year (Interview).

There is no consensus on the threat of foreign competition to the industry. The Europeans and Japanese are the most advanced technologically, but exchange rate fluctuations and language barriers inhibit entry into the U.S. market. Other Asian countries lack the productive capacity to effectively compete, and all competitors face higher supply costs for fuel and paper which must be imported. Domestic producers are most vulnerable to competition for jobs with the longest lead times (e.g., books, art, color separations, some catalogs), and the high quality, multi-color market is threatened where profit margins can be cut (Eckhardt, 1989).

1.3. Industrial organization

The printing industry is known for its abundance of small firms: approximately 80 percent of printing firms have less than 20 employees (Forward Wisconsin, 1987). Printing firms are dispersed throughout the state, although there is a heavier concentration in the southeast. Wisconsin has more than 1200 printing and related firms. Ten of the nation's top 100 printers, in terms of annual sales, are located in Wisconsin (American Printer, July 1990).

It is useful to organize the sector not only by product and process, but also by the scope of the market served and the size of the firm. Printing firms can be differentiated into four basic types, with the first type having two subcategories.[4]

Type IA: Large to very large firms with national and international markets. These firms are generally high speed, multi-color, heat-set web-offset printers, but some large flexographic and screen printers are also included in this group, as well as some large in-plant operations.

Type IB: Large to very large firms that have the same markets as Type IA firms, although the products may be more differentiated or of higher quality. These firms are distinctive due to their innovative management techniques: They have begun to adopt new styles of work organization, training, and service to compete. There is a greater focus on customer needs, which requires more integrated knowledge of processes on the part of workers. The trend is toward more cross-departmental knowledge or even team-centered production. These changes seem to arise from top management's personal philosophy -- whether it is due to a "progressive" management style, fear of losing a competitive edge, desire for expansion, or simply a recognition of new trends.

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[4]While Type II, III, and IV firms do have variations within groups as to their management techniques, this typology does not distinguish between A and B firms for these types. This is primarily because these firms cannot vary in forms of work organization as much as the large Type I firms. Either due to their smaller size or the nature of the work (pre-press trade shops), the division of labor cannot be as deep as in Type I firms, and therefore employers have less control over the organization of work.

Type II: Medium to large pre-press trade shops that have advanced technology, and serve regional as well as national markets. They either market their product directly to the customer or are subcontracted by the printer.

Type III: Medium-sized full-service shops. These firms are likely to serve local or regional customers and to fill local niche markets. They rely heavily on personal and professional contacts with other printers for subcontracting, referrals, and information about the direction in which similar firms are moving. Turn-around ranges from a few days to a few weeks (Interview).

Type IV: Small commercial and quick-print shops with at least five employees. These firms generally have been on the low-tech, fast service end of the industry. While traditionally thought of as distinct segments, as equipment prices for new low-end technology have fallen, quality differences have become less pronounced, and the difference between quick and small commercial printers has eroded. These small shops serve very local markets and often serve individuals as well as businesses. They print things such as invitations and flyers, and provide high-speed duplicating services. Typical turn-around time for a job is one to three days (Interview).

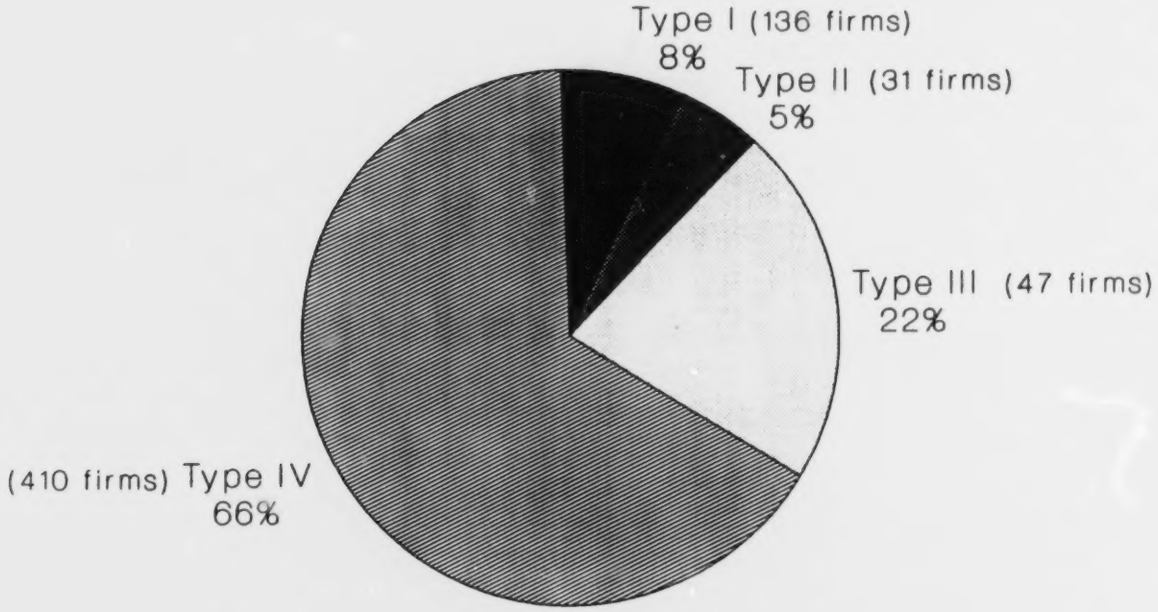
1.3.1. Wisconsin firms

To estimate how many of each firm type exist in Wisconsin, the state Unemployment Insurance (UI) 1989 name and address file primarily was used, since this was the most recent and most complete data source that includes names, addresses, and SIC codes. The 1989 Directory of Manufacturers, 1987 Census of Manufacturers, and lists from various associations and unions were used to verify the UI data and to provide any missing information. As mentioned earlier, there are discrepancies in definitions within the industry. SIC codes are used differently by almost all sources, including self-identification by firms. It should be noted that firms who do not classify themselves as commercial printers may be considered such in the UI data.

Type I firms were defined as commercial printers with 100 or more employees. From the above-mentioned sources, it was determined that there are approximately 47 Type I firms in Wisconsin (see Figure 1-1). It is difficult to differentiate between Type IA and Type IB firms from this data, because the differences are not quantifiable, and some Type IA firms may be in transition to a Type IB status. Distinctions in this report were made based on information obtained from interviews.

Type II firms are firms in SIC 279 (printing trade services) that have 20 or more employees. There are approximately 31 Type II firms in Wisconsin. Type III firms have 20-99 employees and belong to SIC 275. Approximately 136 firms were classified as Type III. Type IV firms have SIC codes 275 or 279 and have five to 19 employees. Type IV accounts for roughly 410 firms in Wisconsin.

Figure 1-1.
Percentage of Wisconsin printing firms, by type



Firm types are as follows: Type I: large to very largeprinters with national and international markets; Type II: medium to large prepress trade shops; Type III: medium-sized commercial printers with primarily regional markets; Type IV: small or quick printers, regional markets

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Type I, II, III, and IV firms make up 636 of the approximately 1200 printing firms in Wisconsin. The remaining firms are those with fewer than five employees (approximately 350 firms) and newspapers (about 230 firms).

1.4. Employment

Wisconsin printing employment grew by 50 percent over the past decade, double the industry's growth nationally (PIW, 1990). Table 1-1 provides an employment breakdown by more specific industry categories for 1982 and 1989. As the table indicates, the commercial printing sector was responsible for the majority of industry employment growth over this period.

Since the industry is spread throughout the state, labor markets and demographics of the printing workforce vary with the locale. Some firms are facing tighter labor markets than others due to low regional unemployment rates or limited access in smaller towns, but almost all firms have recruiting difficulties when state unemployment rates are low. At least one firm has chosen to locate a plant in a region of Wisconsin that has a younger and larger pool of available labor. Other employers noted that they are already looking at "the bottom of the barrel" -- that the people that are still looking for jobs or working as temporary workers in times of very low unemployment "must really have some problems" (Interviews).

The average age of workers varies tremendously across firms. In some firms, the average is in the mid-twenties, while others are facing large waves of retirements in the coming years. The survey shows that average age is highly correlated with growth: Firms with a younger workforce tend to be those that are growing, while firms that are not growing are more likely to have older workforces.

Overall, the industry is fairly similar to other manufacturing industries in its gender composition. Survey response indicate that approximately 25 percent of production employees and 37 percent of all printing employees. In 1986, 29 percent of all manufacturing employees in Wisconsin were women (Wisconsin Labor Market Information, 1987). As in other industries, women employed in printing are heavily concentrated in certain jobs. They are more likely to be hired in typesetting, desktop publishing and other computer work, as well as in low-skilled bindery positions. Based on survey response, the mean percentage of female employees in the pre-press area is 41 percent, while in the bindery area, it is 36 percent. Although women increasingly are hired into more skilled positions, they still are rarely hired as press operators. The mean percentage of women in the press area is 13 percent. A trainer at a large firm stated that women who can meet the physical requirements will make better press operators, since genetically they have a better eye for color. However, a technical college faculty member said, "It is safe to say that a woman trained in the press area will have a hard time finding a job."[5]

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[5]Since women have traditionally been under-represented among skilled printing occupations, there is a need for more research on their access to skills training.

Since printing incorporates a wide range of occupations, firms hire people with varying levels of education. Production jobs are filled usually by high school and technical college graduates, while management or sales jobs customarily are filled by graduates with bachelor's or technical college degrees.

Employees in the printing industry are represented by several unions. The Graphic Communications International Union (GCIU) is the largest in Wisconsin and North America. The GCIU was formed in 1983 through a merger between the Graphic Arts International Union (GAIU) and the International Printing and Graphic Communications Union (IP&GCU). The GCIU has over 600 locals throughout the U.S. and Canada, and over 200,000 members. The number of Wisconsin members is not known, although it is estimated at over 3,000 (Interview). The GCIU represents workers in all areas -- pre-press, press and bindery.

Another printing union, the International Typographical Union (ITU), recently merged with the Communication Workers of America (CWA). The ITU was the oldest U.S. union in continuous existence, and historically represented compositors. As traditional composition has been replaced by electronic typesetting, the ITU has suffered a severe decline in membership. There are also other, small unions that represent printing workers in Wisconsin, such as the International Workers of the World, the International Brotherhood of Printers, and independent unions.

As is common in most industries, unionization is strongly correlated with firm size. There are 18 unionized firms among the survey respondents, with a total of 2,918 employees, or an average of 162 employees per firm, while the nonunion firms averaged 67 employees.

2. Technology and Work Organization

2.1. Technology

Although the industry historically has seen continuous technological advancement, the last 15 to 20 years have seen a virtual revolution in printing equipment. Technology is changing at an ever-faster rate: In the 1960s and 1970s, waves of new technology would occur every six to seven years; now, the cycle is every three to four years. However, the speed and extent of the introduction of new technology into the workplace varies with the type of work, size, and organization of the firm.

Printing involves three major stages of production: Pre-press, press, and binding and finishing. Traditionally, in the pre-press stage, images and type are composited, photographed, proofed, reworked, and transferred to a printing plate. In the pressroom, workers mount the printing plates onto the presses, feed the presses with ink and paper, supervise the quality of the printed product, and perform routine maintenance on the presses. Finally, the product is finished -- which may include cutting, trimming, binding, and packaging -- and prepared for distribution. The following will describe changes occurring in these areas.

2.1.1. Pre-press

Technological change has had the greatest impact in the pre-press area. The entire process from typesetting, color separation, page assembly to platemaking can be digitized, allowing for the work to be done faster with fewer people. The almost universal use of computerized typesetting with "WYSIWYG" (what you see is what you get) view screens has decreased the amount of time spent proofing and reworking text. New systems are doing away with mechanical paste-up through (color) electronic pre-press systems that allow the user to read in text, scan in images, and compose the entire page on the screen. There are now graphic arts cameras that can scan an object directly to the electronic pre-press system and bypass film entirely (Interview).

Since the 1950s, the electronic scanner has taken over the bulk of camera work -- which formerly involved camera operators, engravers, retouchers, and proofers -- using a fraction of the labor (Marshall, 1983). More recent color laser scanners allow for tremendous precision, increased quality, time savings, and lower costs. Years ago, a set of color separations would cost from $600 to $800. Today, a "real top-notch job" can cost around $60-70 (Interview). This drop in cost has helped stimulate demand for an increasing amount of color work.

Type I firms often have some of the most advanced electronic pagination equipment and scanners but usually use it only on the most complex jobs. Most of their film assembly (stripping) is still done on the bench, in part because customers deliver film and in part because it is more cost effective for simpler jobs (Interviews).

Type II firms are most likely to have the most advanced computerized pre-press systems. Although they may still do some conventional stripping, it is used for the simpler jobs. They continuously update their equipment and software. Equipment that is only five to seven years old is now obsolete, and software updates occur much more frequently. One pre-press shop said that at times they have ordered new equipment, and by the time it arrives, there is already an update out (Interviews). These firms must maintain the ability to receive customers' input in many forms -- hard copy, on film, or on disk. As more and more customers have their own desktop publishing systems and software packages, the trade shops must have the appropriate interfaces to transpose the customer's input into the language used in their own system.

Type III firms usually have computerized typesetting. Some are fairly advanced in pre-press, using scanners. For others, assembly work is done conventionally, because equipment costs are prohibitive, given their low volume.

The equipment of Type IV firms varies, but most are likely to have MacIntosh computers for desktop publishing. Some of the commercial shops that print higher quality products may have scanners and computerized typesetting equipment.

2.1.2. Press

Most large printers perform several kinds of printing processes. Type I Wisconsin printers specialize in heat-set sheetfed and web offset, flexography, gravure, and screen printing. In the past, web-fed presses were used most efficiently for long runs; however, new computerized presses have increased press speeds and reduced makeready (mounting of plates, paper, and ink preparation) time, permitting web printers to pursue shorter runs efficiently (PIA, 1989). With computer-assist, information can be stored on a cassette for future use. One industry analyst said that more than one-third of the presses are now computer-controlled (Interview).

Most Type I firms have state-of-the-art computer-controlled presses, in whole or in part. The lithographic process has not changed, and in the press area, automation has served mostly to increase speeds and tighten tolerances. Today, the biggest presses can print in one eight-hour day the same amount that one of the first four-color presses took five full days to produce (Interview). The new presses also have a range of add-ons, such as automatic splicers and feeders, that further increase the speed of production.

Most types of printing are basically the same up until the platemaking stage, and then the processes differ greatly in the press area. The major difference between lithography and flexography is that flexography uses a relief (or raised) surface, while lithography is a chemical process (see Appendix IV). The quality of flexography is generally lower than lithography, but it is getting better and better as the process has improved substantially over the last ten years. Platemaking advances are improving the precision and control, and flexography now permits printing on a wider variety of surfaces and can use a wider variety of inks though still fewer than lithography (Interview).

Because of these advances, flexography is starting to eat into the market of gravure printers. Gravure uses etched plates that produce the highest quality products but are costly to make: Etching plates for a six-color job costs $6,000-6,500, whereas making flexographic plates would cost about $1,000-1,500. Flexographic plate production is also much faster, and the turnover for jobs is much shorter than gravure. Due to the high costs of platemaking, gravure is used primarily for very large runs -- one to two million. In contrast, flexography runs can be as low as a few hundred thousand, while the low end of lithography is almost non-existent (Interview).

Screen printing is generally of a higher quality than lithography, and it can be used to print on a wide range of materials including paper, metal, plastic, fabric, wood, etc. Screen printing is probably the process that differs most from commercial lithographic printing. One respondent from a screen printing firm wrote: "[We are] not really a printer in the sense you refer to in the attached survey. Screen printing uses resources differently than regular printing." In general, screen printers are much more closely related to other industries, such as textiles and fabricated metals.

Most Type III firms have smaller, one- to six-color offset presses. While some shops have computerized presses, most still use conventional equipment. Most Type IV printers have small one and two-color presses and high-speed duplicators.

2.1.3. Bindery

The bindery is usually considered to have the least technologically-sophisticated equipment. One technical college faculty member said, "people used to say 'if you can't do anything else, you can go into bindery,' but that isn't really true anymore due to the advances in this area" (Interviews). The major developments in bindery include faster speeds, computer-control, and machines that perform cutting, folding, stitching, trimming, labeling, packaging, etc. -- tasks formerly performed on separate machines -- in line (Interview). A number of Type I firms have selective binding equipment, which will bind periodicals with regional and other targeted advertisements (Interview). Finishing equipment may also include ink-jet printing for personalization of products and for addressing. However, many firms still use machines that require low-skill manual labor -- such as manually feeding stacks of signatures into the collator, or hand-operating spiral binders. Automated bindery equipment still cannot replace manual labor in adding the extras, such as special pockets and inserts, that customers are demanding (Interview). In Type III and IV firms, some of the bindery equipment is computer controlled; however, bindery machinery is still mostly conventional.

2.2. Work organization

Traditionally in printing, as in most industries, the depth of the division of labor is closely related to the size of the firm. In large firms, employees will specialize in a particular function,

or even on a particular piece (brand) of equipment. In a medium-sized firm, workers are often able to do all of the jobs in one of the functional clusters. In a small job shop, the worker must be capable of performing all tasks (Interviews).

A number of factors have been creating pressures for changes in the organization of work within firms. First, digitization in the pre-press area potentially can wipe out entire occupational categories as one individual at an electronic cluster can perform the functions of what once were many distinct jobs. In the pre-press area, camera operators, proofers, and retouchers have been replaced by scanner operators and Cromalin and Matchprint (proofing system) operators.

Second, computerization has allowed for the division between origin (i.e., conception and design) and production to become blurred. Increased integration with word processing and desktop publishing systems has reduced the amount of re-keying required in typesetting. Design and composition functions have moved back to customers who wish to retain greater control over the production of camera or digital copy (PIA, 1989). Already, a lot of work comes to printers keyed-in, on disk, although customers are at various levels of technological sophistication. One printer noted that the word in the industry for the 1990s is COPS -- Customer Operated Pre-press Systems: Customers may be doing basically all of their own pre-press work up to the platemaking stage, and therefore, the role for quality pre-press in smaller print shops may be limited (Interview).

The development of advanced electronic pre-press systems has also engendered a debate as to whether certain pre-press work is art or production and whether any generalist can push the buttons on the computer or whether the job still requires an individual with extensive theoretical and practical training in the graphic arts (Interviews).

Digitization has not affected the organization of press and finishing jobs as much as those in pre-press. Whereas computers are changing the whole nature of pre-press tasks, there are as yet no real competitors to the traditional print methods (Marshall, 1983). Instead, the application of micro-processors permits faster processing, shorter makeready, and shorter runs. Many respondents cited the potential labor saving effects of automation. It seems that until now, however, there has been little displacement of labor because the market share for the southeast Wisconsin region has increased so dramatically. Printers in southeastern Wisconsin are printing four to five times the volume with only 50 percent more employment. This may change as the industry is now seen to have excess capacity (Interviews).

Automation has not changed the composition of the press crew much. Because paper is the major cost, with the very fast web speeds, makeready time and avoiding waste becomes crucial. There has not been a reduction in crew size because they "need many skilled eyes to control waste." Automation has had the greatest impact in the bindery. Whereas there used to be separate machines (and hence operators) for cutting, folding, stitching, trimming, labeling, packaging, etc., these functions have been consolidated so that one machine can perform all processes in line (Interview).

Type IA firms are likely to have a traditional organizational structure, with a deep division of labor. These firms are characterized by a strong internal labor market: Hiring occurs mostly at the entry level, training takes place on the job or through apprenticeship, and progression up the ladder is slow (or for some workers, it never comes at all) (Interviews). These firms have specific job classifications, and cross-training or switching between departments is rare. The pre-press area usually consists of typesetting, camera, stripping, pagination, and platemaking. A typical press crew and progression path could be the following: General utility worker, jogger, roll tender, compensator (monitors register), second pressman, first pressman. A typical bindery crew would be: Bindery helper, loader mover (driver), apprentice, journey level (Interview). These large firms will often rely on large numbers of temporary workers to help out in the bindery. Quality control is customarily performed by a separate staff -- quality is still usually "inspected-in." Maintenance of the presses is generally performed by separate maintenance crews, although many press crews will perform routine tasks.

Type IB firms have begun to experiment with new forms of work organization. One Type IB firm began using a team-centered strategy about a year ago when they found that they were losing too much control over the product as it moved between departments. It was a very rough transition, but now the process is beginning to run more smoothly. The teams have been implemented mostly in the press areas. Each team works for particular customers so that they develop a relationship with the customer and get to know what the customer wants. The firm tries to provide the workers with as much information about the customer and the products as possible. The team will produce a variety of products for that customer, and they will do all the printing, finishing, quality assurance, packaging and shipping. Team leaders assign tasks among members, and members are encouraged to learn tasks of all team members through the firm's pay-for-knowledge system. This has benefitted the firm in terms of greater reliability and shorter turn-around time (Interview).

Another characteristic of Type IB firms is a flatter organizational structure, that is, fewer layers of management. Pressure to provide better customer service has led to attempts to integrate sales and customer service with production and distribution through cross-departmental teams to facilitate communication. New digitally-controlled presses have left the press crew little to do in the way of manual adjustment. Press crews now spend most of their time monitoring tolerances for alignment, ink levels, spoilage, making adjustments as necessary, and doing periodic quality checks on the product. Many presses also have automatic folders and stackers attached, which has decreased the number of unskilled manual workers doing stacking and loading.

Type II firms are more likely to pay by merit rather than seniority, and promotion usually occurs from within. There is much internal flexibility, and most employees are cross-trained as a result of trying out different jobs before finding their occupational niche. Quality and service are seen as the key to success: "You can have the same equipment and process as other companies, but it is quality and service that brings the client back" (Interview). Customer service representatives develop close relationships with the clients. In order to satisfy customer

demands, it is increasingly important that customer service representatives and technical personnel communicate. It is also increasingly important for Type II firms to have adequate hardware support staff, as more and more work is done digitally. Some firms are moving toward separate staff to maintain computer equipment; in the future, this seems essential.

In Type III firms, employees have broader responsibilities than usually is the case for larger firms. For example, whereas in a large firm workers on the press crew have discrete functions, a press operator in a Type III firm performs all tasks: Mounting plates, setting ink levels, running presses, quality checks, and cleaning and maintaining of the press. Employees are often cross-trained, at least on different pieces of equipment within their department, and preferably in other areas as well to enhance flexibility. Everyone usually can work in the bindery. These firms may employ temporary workers, especially in the finishing area, during crunch periods.

Survey response indicated that almost all Type IV firms use a multi-tasking form of work organization. With few employees, everyone must be able to do whatever necessary to produce the job. Some firms noted that they use a team-centered approach. One respondent wrote that he "switched to a team system with team leaders" because there were "too many employees for one person to manage, too few to hire a full-time manager."

2.3. Total quality efforts

Some of the Type IA firms interviewed used Statistical Process Control (SPC). In these firms a separate staff performs quality and process control, rather than the production staff. While these firms still "inspect-in quality", they are moving toward "building quality into the process" (Interviews). One firm noted that, whereas the union has been cooperative with the firm's quality program and training, there was more difficulty in training and getting production supervisors to accept process control (Interview).

Another large printer noted that it is a long term goal of the company to get the people on the floor to "do SPC stuff", but thus far, the company has taken few concrete measures to move in this direction: "We're no where close to Deming or Motorola." It was even questioned to what extent the industry can ever get to the stage where it is 99.99% defect-free, and stated that firms "must educate the customers" about the limitations to quality (Interview).

Type IB firms are more likely to have process control systems in the press area, although in some firms it seems to be only in the early stages of implementation. Production teams are given responsibility for process control. These firms also have systems for accounting, tracking, and estimation.

For Type II, quality control is part of everyone's job, although some firms have separate quality control inspectors. Most of these firms use computerized inventory and job-tracking systems. For pre-press shops, process control is not relevant.

Type III firms do not generally have a lot of advanced equipment, nor SPC. Given the small number of employees, quality control is usually part of everyone's job. Pressures for quality have lead these firms to recognize the increased importance of employees to have knowledge and be able to communicate about other areas of the production process. Computerized inventory, tracking, and estimation systems are common.

3. Skill Needs

3.1. Skill needs in general

Skill deficits do not appear to impede firms' acquisition and implementation of new technology. Much of the new technology does not create a need for radical retraining. Even where it does, some employers are reported to purchase new equipment without considering skilling and training needs (Interview). Others make extensive training efforts to bring workers up to speed on new equipment after the technology is in place (Interview). Some employers have realized that the new technology (still) requires skilled labor and are taking steps to implement training programs. In all cases, technology decisions generally precede skill and training considerations.

Technological advancements have led to deskilling in some jobs and to reskilling in others. Entire occupations have been wiped out by automation. However, as mentioned above, labor-saving technologies have been accompanied by increased product demand, so workers usually are retrained rather than laid-off.

Due to the diversity in types of firms, occupations, and workforce composition, it is difficult to characterize the overall skill profile of printing industry employees. Job content is changing rapidly in some stages of the process, particularly in pre-press, creating new occupations as well as blurring existing occupational lines.

Pre-press is often considered to be the most skilled part of the process. In the survey, employers were asked what percentage of their pre-press employees they consider to be highly skilled. While answers ranged from 0 to 100 percent, the median was 100 percent. Employees in this area also are more likely than press or bindery workers to have some post-secondary education, since many pre-press jobs are harder to learn on the job. The lithographic process is in a transition from conventional layout, camera, retouching, and film assembly to electronic processes. While the former required manual or "craft" skills, more and more this work has been digitized, requiring computer work. To use the new equipment effectively, however, workers still must have the same understanding of lithographic concepts and processes. Of the survey respondents, 65 percent said that skill requirements in the pre-press area have increased in the last five years, and only five percent thought that they had decreased.

On average, the press department employs more workers than either pre-press or bindery. The lithographic process has not changed, so the basic knowledge and skills involved have remained fairly constant even as technology has increased speeds and capabilities. However, computerized equipment requires greater skills of lead press operators in terms of understanding computers and process control. Sixty-five percent of survey respondents said that skill requirements for press operators have increased in the last five years, while only three percent felt that skill requirements had decreased.

Traditionally, the skill level in press jobs follows a continuum. Employees start off in entry-level jobs, requiring little or no skill, and work their way up in the press crew. In a large

firm, the progression might be stacker, jogger, third press operator, second press operator, and then first, or senior, press operator. In smaller shops, employees often start with some skill or work experience because they must be able to perform all of the press functions (i.e., setting, operating, and maintaining the presses). They usually work their way up from smaller to larger presses and from one and two-color to four, five, and six-color presses.

Some industry analysts contend that automation has led to a polarization of skill requirements in the press area. New technology has decreased the skill content of some press jobs, having done away with manual setting and adjustment tasks, leaving only the least skilled feeding and off-bearing positions, as well as the highly skilled positions (Interview). However, the degree to which the steps in the career ladder are widening differs by firm type, the size of the press, and the level of automation. Some firms with larger presses appear to experience more of this polarization, but many large firms still maintain traditional press crews. Smaller and medium-sized firms, where one or two people operate the presses, still rely on skilled operators who work their way up on different presses. The percentage of highly skilled press employees in the survey ranged from 10 percent to 100 percent, and the median was 75 percent. The variance in skill level can be seen by the mean responses by firm type: The mean in Type I firms was 60 percent; in Type III firms, 80 percent; and in Type IV firms, 84 percent.

The skill level of bindery workers can also vary greatly. While much bindery work has traditionally been low-skill, manual labor, automation and computerization have increased skill requirements (Interview). Whereas workers can basically do only one task (e.g., cutting, folding, stitching, gluing) on conventional equipment, newer machines incorporate many of these tasks in line (Interview). The percentage of skilled bindery workers ranged from 0 to 100 percent, and the median was 50 percent. The mean skill level in Type I firms was 32 percent, while in Type III firms it was 68 percent. Bindery workers in Type III firms are more likely to be cross-trained to operate multiple pieces of equipment. Approximately 38 percent of all respondents indicated that skill requirements in the bindery area have increased in the last five years, while only six percent said that they decreased.

Most employers state that they have difficulty hiring sufficiently skilled workers. Fifty-five percent of survey respondents had trouble, as well as many of the interviewees. For Type I firms, the difficulty seems to be finding and retaining entry-level employees (this may relate to the low entry wages and slow advancement in some large firms); whereas, finding workers who were already trained and skilled appears to be a greater concern for Type II and III firms (who need to have workers "up-to-speed" more quickly).

The following section briefly considers five dimensions of firms' relationship to skills: The overall skill level of their current workforce; the type of skills they prefer; the intensity of their demand for skills; their satisfaction with the supply of skills; and their involvement in training at the workplace. Special attention is focused on how these variable relate to each other.

Skill level.[1] Differences in current workforce skill level by firm type are marked. Most Type I firms (more than three-quarters) reported having a low skill workforce; whereas, the majority of Type II, III and IV firms reported a high skill production workforce. The responses corroborate information obtained through interviews. Large full-service printers, while having some highly skilled workers, usually have many less skilled, narrow jobs, particularly in the bindery. Pre-press trade shops that constitute most of Type II firms have a much higher concentration of skilled workers, because pre-press workers are generally considered more skilled and these firms often have leading edge technology. Workers in small and medium full-service commercial shops, Types III and IV, may be considered more highly skilled because they may need to be able to perform a broader range of tasks, or even multiple jobs, to be more flexible. Type IV firms include a variety of small job and trade shops as well as quick printers. It is therefore difficult to characterize their average workforce skill level.

Table 3-1.
Workforce skill level by firm type
(number and percent of firms)

Type	High Skill
I	4 (21%)
II	5 (71%)
III	18 (58%)
IV	15 (60%)
All	42 (51%)

Skill type. Firms may prefer either general or specific skills. General skills are those that workers can deploy in the external labor market; whereas, specific skills are those that can be used only within one particular firm.. Preference for general skills was indicated by a positive response to the following statement in question 32:

> With today's rapidly changing technology, industry experience and industry-specific training are less important than a general understanding of complex production processes and a willingness to learn new techniques.

Preference for specific skills was assumed to prevail for firms that agreed with the alternative statement:

> To be able to operate our advanced equipment, a worker needs to have in-depth, specific knowledge in the latest printing technology.

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[1]Workforce skill level was determined from questionnaire item 6. If a firm reported that more than 75 percent of their production workforce is highly skilled, it was coded as having a highly skilled workforce.

Forty-two firms (48 percent) were found to prefer general skills, whereas the remaining 45 firms preferred specific skills. However, there was no correlation with firm type, nor was there one with firms' overall skill level.

Demand intensity.[2] Type II and III firms have a much higher demand for skills than do Type I and IV firms. This pattern corresponds to the distribution of average skill levels by firm type. In fact, a firm's intensity of skill demand is positively correlated at the zero-order level with the skill level of its current workforce ($r = .29$, significant at the $p < .01$ level).

Table 3-2.
Demand intensity by firm type
(number and percent of firms)

Type	High Skill
I	7 (33%)
II	5 (71%)
III	24 (77%)
IV	14 (47%)
All	50 (61%)

Examining demand intensity by skill level shows that most firms (65 percent of these) have either a low workforce skill level and low demand intensity or a high workforce skill level and high demand intensity.

Table 3-3.
Demand intensity by skill level

	Demand Intensity		
Skill Level	Low	High	All
Low	23 (58%)	17 (42%)	40 (100%)
High	12 (29%)	30 (71%)	42 (100%)

It is important to understand in which firms skill level and demand intensity do not correspond. The first group, with low skill level and high demand intensity, consists primarily of Type III firms. There are two likely explanations for this. First, regardless of their current workforce

[2]Demand intensity was calculated from question 14. The importance that respondents attributed to each skill dimension was averaged for each skill type. This was then summed and those respondents whose answers were 15 or greater (averaging close to "very important" for each skill type) were considered to require high skills.

skill level, most Type III firms have a high demand for skills because they realize that they will need highly skilled workforces to compete in an increasingly competitive market. (As discussed previously, industry sources indicate medium-sized printers are facing the greatest competitive pressures as a result of new technology and market changes.) This was the case in at least one Type III firm that was interviewed: Due to increasing competitive pressures and a change in management philosophy, the firm has moved more toward a multi-skilling form of work organization. Whereas previously employees were responsible only for their own narrow job tasks, now all employees must understand the entire printing process, what other employees are doing, and where they fit in. Employees may even perform other functions when fluctuating demands dictate. Firms such as these are responding to competitive pressures by increasing their skill level so that they can deploy their workers more flexibly and avoid costly mistakes that result from poor linkages between different stages of the process.

A second explanation for why firms may be in the low skill level/high demand intensity category is that survey respondents' notions of "highly skilled" are influenced by their perceived skill needs or their ideal skill level. Many Type III employers in this category did not report having a high workforce skill level, despite the fact that these firms have a higher percentage of employees with education beyond high school than employers in other firm types. Also, the average tenure for workers in these firms is 12 years -- higher than the average in any other box. This suggests that the responses of Type III firms must be considered in terms of the relative skill level of their workforces. For example, one Type III respondent reported that only 66 percent of their production workforce was highly skilled, despite the fact that the average tenure was almost eight years, the average age was 39, and 43 percent had received some post-secondary education. It is likely that other respondents would have rated the skill level of this workforce to be much higher.

This same explanation may apply to firms in the high skill level/low demand intensity category. These firms have a lower average tenure (five years) and higher turnover than do other firms, with most of this turnover coming from quits. This suggests that respondents may have low demand intensities because the jobs that need to be filled are not challenging, and, therefore, it is difficult to hire and retain workers for these positions. They may consider the stable portion of their existing workforce to be highly skilled because these are the people that do have demanding jobs. It may also be that the respondents think of these employees as highly skilled because they stay on the job and, therefore, are considered highly skilled relative to the employees that quit after a few months. An example of a respondent in this category is one firm that reported an average skill level of 100 percent, an average tenure of one year, an average age of 30, and no employees with any education beyond high school.

Regarding general versus specific skills, crosstabulation indicates that, on average, firms that prefer specific skills have higher demand intensities. However, the correlation between skill type and demand intensity is not significant.

Dissatisfaction with skill supply.[3] Whereas Type I and Type IV respondents were evenly split in terms of satisfaction with the potential skill supply, more than two-thirds of Type III respondents were dissatisfied. Type II firms were the least dissatisfied.

Table 3-4.
Dissatisfaction by firm type
(number and percent of firms)

Type	Dissatisfied
I	11 (52%)
II	2 (29%)
III	22 (71%)
IV	15 (50%)
All	50 (56%)

There is no significant correlation between satisfaction and current workforce skill level, preference for general skills, or demand intensity.

Activity in workplace training.[4] Type II firms are the most active in providing formal workplace training; Type I and III firms basically are evenly split; and Type IV firms are the least active. Type II firms are likely to train since they are often on the cutting edge and require constant (re)training to keep up with technology. Although our results appear to conflict with much of the literature on training, which suggests that provision of training is positively correlated with firm size, such firm-sponsored training usually is provided to managerial rather than production employees (Stern and Benson, 1989). Therefore, it is not surprising that Type I firms, despite their greater resources, do not overwhelmingly provide training to their production workers. Size can be an explanatory factor in determining training for smaller firms, however, as the smallest firms (Type IV) generally do not have the personnel or resources to provide formal training.

[3]Dissatisfaction with skill supply was calculated from question 15. The skills that employers found to be lacking were averaged for each skill type and summed. Those respondents whose scores were 1.5 or greater were considered to be unsatisfied with the skill supply.

[4]Activity in workplace training was determined from questions 16 and 17 which measured, respectively, the average number of hours of orientation training and of formal training other than orientation provided annually to each production employee. The number of hours for each type of training was added, and those firms that provided more than 42 hours of training per worker were considered to be active in workplace training.

Table 3-5.
Activity in training by firm type
(number and percent of firms)

Type	Active
I	10 (50%)
II	6 (86%)
III	15 (54%)
IV	11 (44%)
All	42 (52%)

Crosstabulation shows that firms with higher skill levels are more likely to be active in workplace training. This greater activity in training may be the reason why these firms consider their workforce to be more highly skilled.

Table 3-6.
Activity in training by skill level

	Activity in Training		
Skill Level	Not Active	Active	All
Low	21 (54%)	18 (46%)	39 (100%)
High	13 (36%)	23 (64%)	36 (100%)

Firms that are dissatisfied with the skill supply are also more likely to train than those that are satisfied.

Table 3-7.
Activity in training by dissatisfaction

	Activity in Training		
Satisfaction	Not Active	Active	All
Satisfied	20 (53%)	18 (47%)	38 (100%)
Dissatisfied	18 (38%)	29 (62%)	47 (100%)

Overall, high activity in workplace training is not significantly correlated at the zero-order level with either skill level, skill type, demand intensity, or satisfaction.

To clarify further the relationships between the five variables, a factor analysis was performed on them, including, in addition, organizational size (the most pervasive influence on organizational structures and practices according to established theory). Factor analysis extracts underlying commonalities within sets of variables, thereby simplifying a given structure of correlations and covariations and in effect replacing a set of original, measured variables with fewer, aggregate, "constructed" variables. Like any multivariate technique, factor analysis controls for covariation with third variables; it thus moves beyond the simple bivariate correlations used in the preceding discussion and takes into account the embeddedness of the relationship between any two variables in a larger structure of covariations.

A simple orthogonal, varimax solution extracted three factors which accounted for 65.8 percent of common variance. The factor matrix (Table 3-8) indicates that a high skill level tends to go together with high intensity of demand for skills and with small organizational size (Factor 1). Furthermore, it shows that firms that feel they require industry or equipment-specific skills, tend to be dissatisfied with the supply of skills offered by the labor market (Factor 2). Finally, activity in workplace training is found to be weakly related to a firm's skill level, but is otherwise an independent dimension of firms' behavior with respect to skill demand and skill provision (Factor 3). Since under an orthogonal solution factors are by definition not correlated with each other, it appears that whether or not a firm has the characteristics of a craft shop (Factor 1) is unrelated to whether it is an unsatisfied potential user of specific skills (Factor 2), as well to the extent to which it invests in training at the workplace (Factor 3). The absence or presence of craft-like skill use and skill demand; demand for specific skills and dissatisfaction with its supply; and the extent to which firms train their own workers are the three most important differences between firms in the sample; two-thirds of the variation and covariation in firms' responses to the survey questions can be reduced to these three factors.

Table 3-8. Factor matrix

	Factor 1	Factor 2	Factor 3
Skill level	**.669**	.149	.471
Skill type (general)	-.012	**-.771**	.127
Demand intensity	**.782**	-.004	-.069
Dissatisfaction	.005	**.757**	.121
Activity	-.121	-.038	**.917**
Size	**-.747**	.042	.153

3.2. Emerging skill needs

As discussed previously, both technological change and increased customer demands for higher quality, service, flexibility, and shorter turnaround time have created pressures on printing firms

that frequently are changing the organization of work. These pressures and changes affect skill requirements as well. To understand this process, it is important to distinguish between types of skills. In the present section, a classification of skills in six categories will be introduced.[5]

Human capital theory distinguishes between general skills that are portable in the external labor market, and specific skills that can be used only within one particular firm. The disadvantage of this conceptualization is that it focusses on the firm as employer, rather than on the intrinsic capacities of the worker as employee: Whether a skill is specific or not depends exclusively on how many firms need it. While a definition like this may be useful for other purposes, it cannot guide decisions on curricular content.

The skills that are required for productive work have a social as well as a technical dimension. With respect to the first, workers must be able to relate to other workers and to their supervisors in such a way that a necessary minimum of social integration at the workplace can be secured. Above all, workers must be motivated to work and to work well. Furthermore, in addition to being able to understand the norms and rules that govern interaction in a work-place, they also must be willing and able to follow them (for example, to show up on time, get along with other workers, respond to questions truthfully, care about the recognition of their supervisors, etc.). The kind of qualifications required for this can be called attitudinal skills.

Moreover, while firms rely on and utilize workers' integration in informal social groups, they are also formal organizations that operate according to principles that differ from those of face-to-face interaction. To be able to function in an organized social setting, workers therefore need a second kind of skills which one can refer to as general organizational skills. Most basically, these consist of an ability to understand and apply the rules that govern the flow of communications and materials through a formal organizational setting. More specifically, they involve a capacity to understand a complex division of labor and competence, enabling workers to coordinate their activities with those of others outside their immediate work environment; anticipate problems their actions may cause "down the line"; intelligently call upon organizational resources if needed; and know when and how to circumvent formal procedures, or shortcut formal lines of communication, in cases of "organization failure". General organizational skills are attained mostly through work experience, but they are not specific to any one firm or particular occupation. Being as general as they are, they are difficult to define operationally for exact measurement, and they shade into motivational skills. For the printing industry, good proxies would seem to be oral communication skills, the ability to work in groups, and the ability to work quickly and meet deadlines.

The next three categories of skills are of a technical kind. Basic skills are those that normally are acquired at the elementary school level. Above all, they include reading, writing, and arithmetic -- the famous "three Rs" or what today often is referred to as "workplace

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[5]This classification builds on a number of similar efforts none of which is theoretically "clean". Rather than striving for conceptual neatness, for the purposes of the present research it was decided to use a simple and intuitively plausible typology even if it is not one-dimensional and ultimately only pragmatically justified.

literacy" or "workplace numeracy", respectively. These skills are so general that they are expected to be at the command of all workers, regardless of industry and occupation. These are different from general occupational skills, the next category, which are definitive of a particular occupation. Strictly defined, an occupation is a set of systematically interrelated and certifiable worker capacities, usable for the production of a specific product or the operation of a specific process. Constitutive of an occupational qualification is that it includes an understanding of some of the general principles that govern the separate and different activities defining the occupation. It is in these principles that the unity and identity of the occupation is based.[6]

For the purposes of this study, general-occupational skills are defined as knowledge of printing and the printing industry that is not specific to an individual firm or piece of equipment. While this includes certified occupational qualifications in the strict sense, it is not limited to it. Basically, this is because traditional occupations in printing were often narrowly defined, and in any case have for some time been blurred under the impact of technological change. Partly because there seems to be no flexible and easily usable mechanism of updating occupational qualification profiles, reliance on broad, systematic, formalized and certified occupational skills seems to have declined in the printing industry (as it has been the case generally in American manufacturing). Today, what comes closest to occupational skills are a general understanding of the industry, knowledge of the printing process, and printing-related computer skills, whether these are formally certified as part of a printing occupation or not.

Different from general-occupational are specific skills that may be of either a specific-organizational or a specific-technological kind. Specific-organizational skills are limited in their applicability to one particular employer: They include experiential knowledge of a firm's particular work organization and organizational "culture." Specific-technological skills consist of the ability to operate a particular piece of equipment: They are not firm-specific.[7] For example, an employee who can operate a Heidelberg GTO four-color press may be desirable to many employers. With growing work experience, both specific-organizational and specific-technological skills may shade into general-organizational and general-occupational skills, respectively.

Finally, foundational skills are those that are necessary to learn new skills and adapt to new technologies, work organization, and occupational requirements. These skills are not necessarily dependent on work experience, although they may increase with exposure to a work environment. Moreover, foundational skills clearly include a motivational and a basic skills component, but they are not reducible to either: Someone may be highly motivated but none-

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[6]An occupation differs from a job in that it is not an activity, but a formally certifiable social identity of a person: While operating a printing press is a job, being a printer is an occupation that continues to attach to the individual even if she or he at the moment happens to work as a baker.

[7]Employers can implement the same equipment in different ways to some extent, which could lead to differing skill requirements. Those skills that vary due to the work organization of particular firms are then, in fact, firm-specific.

theless unable to learn a new skill, or she may have to employ her foundational skills to acquire lacking basic skills. Similarly, foundational skills are likely to be higher in workers that have been taught some basic principles underlying the work they are doing; but command of basic principles alone, without corresponding experience in their application, is not likely to facilitate skill development.

The following sections describe survey response relating to these six skill types.[8]

3.2.1. Attitudinal

Almost all employers feel that a "good attitude" is crucial for new employees. A good attitude can mean anything from showing up on time to being a part of the company team. Eighty-five percent of survey respondents said motivation was a very important quality for new production employees to have, and 54 percent said that it was an attribute that new hires often lack.

Firms rely on a good attitude for various reasons: Type II firms are pressured by continuous technological change, and employers need employees who are willing to continually change and learn with the company. Type IB firms may see this positive attitude as important for implementing new organization-centered or "Japanese-style" management systems. Some firms simply seemed to have difficulties finding people to show up to work on time.

3.2.2. Basic

Employers indicate that employees need basic skills now as much as ever. The majority of survey respondents indicated that math and reading skills are very important for production employees (53 and 79 percent respectively). For both of these basic skills, around 40 percent of employers said that new production workers are lacking in these areas. Math skills are

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[8]Questions 14 and 15 on the survey form were used to assess firms' perceptions of the importance of various skills and whether these skills were lacking among new employees. The fourteen skill dimensions were used to calculate indicators of the six skill types described in section 3.2. The six skill types were composed as follows: Attitudinal – motivation and ability to follow instructions; basic skills – math, reading, and writing; general-occupational skills – general understanding of the industry, computer skills, and knowledge of the printing process; general-organizational skills – oral communication skills, the ability to work in groups, and the ability to work quickly; specific skills – knowledge of specific technologies and/or equipment; and foundational skills – the ability to adapt and learn. The value of each skill type was calculated by taking the average of the response values for each composite dimension.

Although knowledge of chemistry and physics was included on the questionnaire, survey response indicated that firms do not regard this skill as important, so it was not included in the composite indicators.

Development of the skills dimensions was based on industry interviews; however, placement of these dimensions under various skills types was somewhat subjective. For example, computer skills could be seen as either basic or general occupational skills. Similarly, oral communication may be as much a basic as a general-organizational skill.

important, because the industry requires precise measurements; therefore, workers must be able to read blueprints and rulers, as well as to do calculations. One interviewee noted that, as more equipment is made overseas, workers are having to learn the metric system (Interview). An increasing number of employers have noted the importance of reading skills as a result of costly mistakes from employees misreading job tickets (Interview). Writing skills are less important in printing. Although several interviewees mentioned that spelling skills were important, it is acknowledged that these skills are becoming less important as computers and word processors are able to correct for spelling.

3.2.3. General-organizational

General-organizational skills, those gained through "real world" or work experience, continue to be important for workers in the printing industry. Due to the ever-changing nature of the industry, the blending of occupational boundaries, the blurring of lines between customers and printers, skills such as the ability to communicate well, to work under pressure to meet deadlines, and to work with others are more important now than ever. The ability to meet deadlines was considered to be a very important skill for 81 percent of survey respondents, and 63 percent considered that ability to work in groups to be very important. More than one-third of respondents indicated that new employees lack the ability to work at industry speed. This is one area, in particular, where interviewees and survey respondents found technical college graduates to be lacking. While small and medium firms may prefer to hire technical college graduates because they have occupational training, they prefer to hire those with a few years of work experience, who are "up to speed", have "knowledge of the real-world," and are "deadline-oriented" (Interview, Questionnaires).

Changing customer requirements and new forms of work organization place a premium on communication skills and the ability to work in groups. Better service requires increased contact and communication with customers, and more and more often this includes production workers as well as customer service representatives (Interview). Fifty-one percent of respondents felt that oral communication skills are very important for production employees. Thirty-seven responded that this skill was lacking among potential employees.

3.2.4. Specific

In general, specific-organizational skills, knowledge and acceptance of company organization and "culture," are most important to Type IB and Type III firms. Firms that have more team-centered forms of work organization require their employees to have a greater understanding of the particulars of the process as organized by their firm. This knowledge is important to facilitate communication among employees within teams and between functional departments, as well as with customers.

Overall, 35 percent of survey respondents felt that knowledge of specific skills is very

important. Twenty-three percent find that, as an overall skill profile, a detailed knowledge of specific equipment and technologies is very desirable for new employees. Thirty-eight percent of employers agreed with the statement: "To be able to operate our equipment, a worker needs to have in-depth, specific knowledge in the latest printing technology."

These skills are of concern to the most technologically advanced firms. In the press area, some of the larger presses are faster and have more "bells and whistles" that employees must learn to operate. However, these presses are generally very large and very expensive, and therefore, training usually must occur in-house. Similarly with advanced pre-press equipment, while some employers expressed a desire for new employees to have working knowledge of specific equipment (e.g., a particular brand of scanner), it was acknowledged that training on any scanner would be useful, and that it could not be expected that providers train on a firm's particular type of equipment.

3.2.5. General-occupational

Since the pre-press area has been the most affected by changing technology, occupational skills in this area are also undergoing the most change. As technology rapidly advances, the training providers have had a difficult time keeping up with the latest equipment. Currently, employers in this area are most concerned with employees being able to operate a scanner or having proficiency with electronic pre-press systems. Although this equipment does differ among firms, the principles remain the same for most systems so that training on any brand of this equipment is helpful.

While craft occupations such as camera operators, retouchers, and conventional strippers are being replaced by new computer-based occupations such as scanners and electronic imaging workers, craft knowledge and an understanding of print theory is still necessary. One interviewee remarked that the new computer workers "still need the old core skills, theory. They still need to understand halftones and know what a good line shot is." If workers do not have this broader occupational knowledge, have a grasp of certain fundamentals, "they can't handle unknown situations" (Interview). Some interviewees have noted that although traditional craft skills are being replaced, it is "the workers who had good hand techniques prior to computerization [who] have been the most successful at adapting to the computerized systems" (Interview). All interviewees commented that, despite technological advances that obviate the need for craft work, workers still need to know the basic core theory and vocabulary of the printing process. Particularly in pre-press, as electronic systems integrate the functions of multiple craft occupations, and the entire process becomes more fluid, it is probably more important now than ever for workers to have a broad understanding of the printing process and the general concepts of the industry. One instructor, explaining that workers must have a graphic arts training and not just computer skills, remarked: "You can train someone to use a scalpel, but [that does not make one] a surgeon" (Interview). Another interviewee explained this by saying that changing technology and computerization has led to a situation where what you see is <u>not</u> always what you get: Workers need to understand the processes and products that are

behind the image on the screen (Interview). Despite the advanced technology available, one interviewee noted that currently there is a real shortage of experienced conventional strippers (Interview).

The transition to computer-controlled presses is changing skill requirements in the press area. New digitally controlled presses require operators to have an increased understanding of computers. Computers cannot completely replace printing skills and craft knowledge, however. While they may be less important for "noncritical printing, like newspapers . . . high-quality four-color commercial and book printing requires [these skills] to ensure quality," so that press operators understand what to look for when they are checking a job (Interview).

Some equipment vendors claim that computerized systems eliminate the need for printers with traditional craft knowledge, permitting them to be replaced with a few computer operators. Contrary to this, 43 percent of survey respondents indicated that an understanding of printing processes is very important for new employees, and 46 percent felt it somewhat important, compared to 15 and 54 percent respectively for computer skills. One industry analyst told us: "Don't believe anything that an equipment vendor says: The new technology still requires skilled labor" (Interview). A general-occupational base knowledge is necessary for printing employees, regardless of the technology.

For effective communication between production workers, sales workers, and customers, it is more important than ever that all employees have a broad understanding of the printing process and the firm's capabilities, rather than narrow knowledge of the job tasks. Forty percent of survey respondents felt that an understanding of the industry was a very important skill.

3.2.6. Foundational

The ability to learn is increasingly important as the pace of technological change increases, customers become more demanding, and products are more sophisticated and diversified. In this ever-changing environment, workers can no longer expect that specific, narrow skills can be learned once and deployed throughout their careers. To be competitive in this environment, workers must have foundational skills, the capacity to continuously adapt and learn.

Of survey respondents, 87 percent reported that the ability to adapt and to learn was a very important skill for new production workers. One survey respondent wrote that general training would be more relevant "if [the] employee can transfer knowledge to different setting[s]. I have noticed less ability to 'transfer' knowledge than I would like to see." Most interviewees, both union and management, also stressed the importance of this capacity. This was emphasized more by the most technologically-advanced firms, particularly trade shops. The ability to adapt and to make decisions when faced with new situations (problem solving) are particularly important in the area of desktop publishing (DTP). Since the process is new and still evolving, there are few set guidelines or rules for many jobs. Text and images can arrive from the customer on a variety of media. Even when the input is entirely on diskette, customers and

designers use a variety of software packages, and the operator must be able to work with and translate this data into the language used on the in-house electronic imaging system. These computer skills are difficult to teach, and difficult to memorize -- no manual or trainer could ever prepare a computer operator for all situations that may arise (Interview).

Foundational skills allow people with general-occupational skills in a related industry to learn printing skills. One interviewee mentioned that "there used to be a shortage of good camera people, so (employers) looked for people who had this as a hobby, because they understood the process. A draftsman would make a good stripper, because both work with math. A machinist would make a good press operator because they understand how a piece of machinery works." The foundational skills allow for the transfer of general-occupational skills.

3.3. Skill needs in synthesis

3.3.1. Important skills

On average, firms ranked attitudinal and foundational skills as the two most important types of skills required for printing production employees. Eighty-nine percent of respondents indicated that attitudinal skills are "very important", and 87 percent indicated the same for foundational skills (see Table 3-9). General-organizational skills were very important to 65 percent of respondents, followed by 46 percent for basic skills, 35 percent for specific skills, and 33 percent for general occupational skills.

Regardless of firm type, essentially the same ranking of importance was accorded to the various skill groups. For each firm type, attitudinal skills and foundational skills were rated most important, followed by general-organizational skills. The relative rankings of the remaining three skill groups varies by firm type but in general follows the pattern of the averages described above. The rank order correlations for skill importance by firm type is highly positive and significant (see Table 3-10).[14]

Although all firm types appear to attribute the same relative importance to the various skill groups, they differ in terms of intensity. Table 3-11 reveals that, with the exception of attitudinal, basic and foundational skills, all other skill types are less important to Type I firms than to Types II, III, and IV. This accords with the overall lower skill requirements of these Type I firms, as described previously in section 3.1. Type I firms generally have a more well-defined and slower job ladder, so that necessary skills have been learned on the job by the time there is an opening for an employee to move up. For this reason, attitudinal and basic skills and an ability to learn are considered very important and general-organizational, specific, and general-occupational skills much less so.

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[14]Rank-order correlations measure the degree of similarity between the orderings of different lists. A correlation of 1.00 indicates identical ordering; -1.00 indicates exact inverse ordering; and 0 indicates a random relationship.

Table 3-9.
Importance of skills for printing employees[a]
(percentage of employers answering "very"[b])

Skill[c]	Type I (n = 21)	Type II (n = 7)	Type III (n = 31)	Type IV (n = 30)	Total (n = 89)
Attitudinal	83	86	97	87	89
Basic	41	33	61	38	46
General organizational	52	67	77	60	46
Specific	14	43	45	37	35
General occupational	19	43	37	36	33
Foundational	81	100	97	77	87

Source: 1991 "Emerging Skill Needs" survey.

[a] Columns do not add up to 100% because respondents could check more than one box.
[b] Choices were "very", "somewhat", and "less".
[c] Skill groups break down as follows: Attitudinal: motivation, ability to follow instructions; Basic: math, reading, and writing; General organizational: oral communication skills, ability to work in groups, and the ability to work quickly; Specific: knowledge of specific technologies and/or equipment; General occupational: general understanding of the industry, computer skills, and knowledge of the printing process; Foundational: the ability to adapt and learn.

Table 3-10.
Rank order correlations for skill importance, by firm type

	Type I	Type II	Type III	Type IV	All firms
Type I	1.0000	.6715	.9316	.9429	.9429
Type II		1.0000	.7372	.6715	.6715
Type III			1.0000	.9833	.9833
Type IV				1.0000	1.0000
All firms					1.0000

Source: 1991 "Emerging Skill Needs" survey.

For Type II firms, 100 percent of respondents felt that foundational skills are very important for production employees, and 86 percent felt the same for attitudinal skills. Type II respondents were more likely than respondents of other firm types to answer that general-occupational skills were very important, mostly due to the greater importance of computer skills, as well as a general understanding of the printing process. This is because these trade shops often have the most sophisticated computerized equipment and, although Type II employees are not printers, a knowledge of the printing process is important for effective employee interaction with customers and printers. Type II employers also responded at a high rate that specific skills are very important, probably because Type II employees are more likely to be working on highly-advanced computerized equipment. Although the skills learned are somewhat transferable (e.g., ability to operate a scanner), knowledge of the particular piece of equipment used at the shop is necessary.

Most Type III respondents also indicated that attitudinal and foundational skills are very important (97 percent for each) for production employees. General-organizational skills were ranked very important by more than three-quarters of Type III firms, a higher proportion than for any other firm type. This can be explained by the greater need in these firms for workers to multi-skilled to provide flexibility when necessary. Basic skills were rated as very important (61 percent) for more Type III firms than for any other firm type, and Type III respondents were also more likely than other respondents to answer that reading and writing skills were very important.

Type IV firms have a somewhat lower level skill requirement than Type II and III firms. While small commercial shops may have skill demands that are similar to medium-sized firms, this category also encompasses quick printers with low skill needs. One survey respondent wrote: "The quick printing industry is not particularly embracing advanced equipment nor rapidly changing technology, nor are complex production processes a factor." Attitudinal and foundational skills are considered very important, by 87 and 77 percent of respondents respectively, followed by general-organizational skills (60 percent). One component of general organizational skills in particular is crucial to Type IV firms -- the ability to work quickly and meet deadlines. Since small print shops maintain their competitive edge through their fast turn-around time, employees must be capable of keeping up.

In sum, although some firm types (Type I and IV) have lower skill requirements for entry-level workers overall, all firm types rank skills in essentially the same manner in terms of relative importance. Attitudinal and foundational skills, followed by general-organizational skills -- that is, those skills that have a more social than a technical dimension -- are most valued by all employers. For firms in which technical skills can be more easily learned on the job (Type I) or in which they are relatively less important (Type IV quick printers), the more social skills are the only types accorded great importance. For firms that require the majority of their employees be able to operate the most sophisticated equipment (Type II) or be able to overlap and perform multiple jobs due to firm size (Type III and some Type IV), social skills are still considered extremely important, but more technical skill types -- basic, occupational, and

Table 3-11.
Skills that are lacking among potential printing employees[a]
(percentage of employers answering "yes")

Skill[b]	Type I (n = 21)	Type II (n = 7)	Type III (n = 31)	Type IV (n = 30)	Total (n = 89)
Attitudinal	45	29	47	42	43
Basic	38	24	49	33	39
General organizational	25	24	33	29	29
Specific	24	29	45	23	31
General occupational	33	33	41	22	32
Foundational	19	14	29	20	22

Source: 1991 "Emerging Skill Needs" survey.

[a] Columns do not add up to 100% because respondents could check more than one box.
[b] Skill groups breakdown as follows: Attitudinal: motivation, ability to follow instructions; Basic: math, reading, and writing; General organizational: oral communication skills, ability to work in groups, and the ability to work quickly; Specific: knowledge of specific technologies and/or equipment; General occupational: general understanding of the industry, computer skills, and knowledge of the printing process; Foundational: the ability to adapt and learn.

Table 3-12.
Rank order correlations for lacking skills, by firm type

	Type I	Type II	Type III	Type IV	All firms
Type I	1.0000	.4592	.7714	.8286	.9429
Type II		1.0000	.4370	.2622	.6118
Type III			1.0000	.7714	.8857
Type IV				1.0000	.7714
All firms					1.0000

Source: 1991 "Emerging Skill Needs" survey.

specific -- are also considered important.[15]

3.3.2. Lacking skills

To the extent that the responses can be aggregated, attitudinal and basic skills emerged as those that firms considered to be most lacking among potential employees, on average. Forty-three percent of employers responded that attitudinal skills were lacking, while 39 percent felt that basic skills were lacking. General-occupational skills were reported as lacking by 32 percent of employers, specific skills by 31 percent, general organizational by 29 percent, and foundational by 22 percent (see Table 3-11, page 38).

The relative rankings of lacking skills do not correlate as highly across firm types as do the rankings of the importance of skills, especially for Type II firms (see Table 3-12). Furthermore, the rankings of lacking skills are not significantly correlated to the rankings of important skills for any firm type, and are even negatively correlated in some cases (see Table 3-13).

There are several possible explanations for these low correlations. First, respondents may have different perceptions of what "lacking" means. Lack may indicate the objective absence of a particular necessary skill (what the question intends to measure). However, it may also indicate a firm's dissatisfaction with the skills of the existing labor force. Finally, the response may reflect more of a relative comparison between the skills of the firm's existing, more experienced, workforce and those of potential employees than the objective skill requirements for entry-level employees.

Second, it may be that the respondents are not familiar with the skills of potential employees, either because the firm has not attempted to hire many new people, or because the individual respondent was not involved in the hiring process. While personnel managers or trainers most likely know what skills are important for employees, they may have less familiarity with the skill level of the potential labor supply if they have not had to make many hiring

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[15]Factor analysis of firms' demands for the various skill types reveals a surprisingly clear division between industry-specific and industry-unspecific skills. Using firms' responses on the importance of the six skill types, attitudinal, basic, general-organizational and foundational skills are found to hang tightly together, as are general-occupational and printing-specific skills.

	Factor 1	Factor 2
ATTITUDINAL	.875	.116
BASIC	.584	.113
GENERAL-ORG	.756	.175
SPECIFIC	.028	.919
GENERAL-OCC	.288	.849
FOUNDATIONAL	.775	.076

Table 3-13.
Rank order correlations for important and lacking skills, by firm type

Lacking	Important				
	Type I	Type II	Type III	Type IV	All firms
Type I	.2571				
Type II		-.3320			
Type III			-.2070		
Type IV				.3714	
All firms					.0286

Source: 1991 "Emerging Skill Needs" survey.

Table 3-14.
Skill gap indices, ranked from highest to lowest score

VL[a]	VSL[b]
Motivation	Motivation
Reading	Reading
Able to follow instructions	Math
Able to work quickly	Computer skills
Math	Oral expression
Oral expression	Able to work quickly
Able to learn	Able to follow instructions
Knowledge of printing process	Knowledge of printing process
Able to work in groups	Written expression
Understanding of the industry	Knowledge of specific equipment
Knowledge of specific equipment	Understanding of the industry
Computer skills	Able to learn
Written expression	Able to work in groups
Chemistry/physics	Chemistry/physics

Source: 1991 "Emerging Skill Needs" survey.

[a] Very important and lacking skill.
[b] Very or somewhat important and lacking skill.

decisions. In these cases, perceptions of lacking skills may be based on dissatisfaction with the skills of their existing labor force or may simply be subjective or random responses.

Another possible explanation is that the potential labor supply could vary significantly by region. For example, employers competing for new hires in a region with very low unemployment may be more dissatisfied with potential employees than employers in a region with a larger pool of job applicants.

A final reason may be that employers of various firm types face different pools of applicants, because they have different skill needs and thus require different qualifications for entry-level positions. As discussed previously, Type II and III firms are more likely to have higher skill requirements. Although these firms, like Type I and IV, ranked attitudinal and foundational skills as the most important for all production workers, they also consider more technical skills to be necessary, whereas Types I and IV do not. Thus, for Type II and III firms, the hiring decision (from which perceptions of lacking skills are derived) hinges on whether potential employees lack occupational and specific technical skills.

Examining relative rankings by firm types highlights the variance of responses to this question. Type I and Type IV firms both placed attitudinal skills as the most lacking, followed by basic skills. This likely is due to the lower skill requirements of these firms. Since applicants usually are not required to have a background in printing, hiring decisions are often made solely on attitudinal and basic skills.

Applicants for jobs in Type II firms usually have some level of experience or education in printing and, therefore, may be judged by different standards than applicants to other firms. In fact, Type II respondents rated general-occupational skills to be the most lacking. Employers in these firms are looking at potential employees' computer knowledge and understanding of the printing industry and printing process when hiring.

Type III respondents were most dissatisfied with potential employees. Type III employers were more likely to find employees lacking in all skill groups than employers of any other type. This dissatisfaction is most likely related to the importance of multi-skilling and the more flexible deployment of labor in these firms. In Type III firms, each individual employee is more critical to the organization, so employers try to maintain low turnover: Type III respondents had the lowest turnover rate among all firms (9 percent versus a 20 percent average for all other firm types). To keep turnover low, Type III employers may be more selective in hiring decisions in an effort to get the best fit.

One consistency in response across firm types was that despite the importance of foundational skills, on average, all types placed it as the least lacking. This could be due to the difficulty in identifying this skill, particularly in potential employees. Alternatively, based on experience with their existing workforces, employers may feel that most workers can adapt and learn.

3.3.3. Skill gaps

To examine employers' perceptions of important and lacking skills in further detail, an indicator of "skill gap" was developed to measure to what extent the important skills overlap those that are seen as lacking. Two indexes were created: One to measure those skills that employers found to be very important and lacking (VL); and one to measure those skills employers found to be very or somewhat important and lacking (VSL).[16] These indicators enable one to examine some of the individual skills that are part of the six skill groups.

Although the rank order correlation for the two indices (VL and VSL) is positive and significant ($r = 0.67$, $p < .01$), they are not identically matched, so analysis and comparison of the two rankings provides some interesting information. According to both rankings, the largest gap existed for motivation, followed by reading (see Table 3-14, page 38). The VL index indicates that attitudinal and basic skill dimensions ranked highest in general. By comparison, the VSL indicator shows the relative ranking of math and computer skills increases; whereas, the ability to follow instructions declines in importance. Both rankings indicate that the greatest gaps exist for attitudinal and basic skill dimensions; however, for the VSL indicator, what could be considered higher order, or more technical, skills rank relatively higher. These data show that employers feel very strongly about the need for attitudinal and very basic skills. When less intensive feelings are included, more technical and mechanical skills, such as computer knowledge, rise in importance.

While the above measure of skill gap ranks individual skills, a second indicator of skill gap was created to determine which firms are experiencing the greatest skill gaps.[17] This measure of skill gap is positively correlated with activity in workplace training ($r = .27$, significant at the $p < .01$ level). In other words, those firms with the largest perceived gap between their skills requirements and the skills of the available labor force are the firms that are most active in workplace training, on average. This measure of skill gap is not significantly correlated with workplace skill level or skill type (general versus specific).

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[16]For each of the fourteen skill dimensions, the percentage of employers that felt the skill to be "very important" out of those that felt the skill to be lacking was calculated. A similar percentage was calculated for those firms that felt the skill to be either "very" or "somewhat" important divided by the number who indicated the skill to be lacking. These percentages were weighted, respectively, by the percent of firms that considered the particular skill dimension to be "very" important (or "very" or "somewhat" important). These weighted percentages provide a relative ranking of survey respondents' perceptions of the gap between need and supply along each skill dimension, weighted by the intensity of need.

[17]For each observation, the degree of importance was multiplied by the degree of lacking for each skill group and then summed across all groups to evaluate the skill gap intensity for that firm. A score of zero indicates no skills are important, or none are lacking. A score of 18 indicates that all skills are important and lacking.

A dichotomous variable was created by assigning a code of 0 to firms with a low skill gap (indicated by a gap measure less than or equal to four) and a code of 1 if they have a high skill gap.

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Type III employers have the highest skill gap, on average. More than two-thirds of Type III firms have a high skill gap; whereas, the majority of Type I and Type II firms have a low skill gap, and Type IV firms are evenly split.

Table 3-15.
Skill gap by firm type

Type	High Skill Gap
I	8 (38%)
II	2 (29%)
III	21 (68%)
IV	15 (50%)
All	46 (52%)

In summary, when strong employer preferences are considered, the greatest skill gaps exist for attitudinal and basic skills. These types of skills usually are assumed to be developed through basic schooling, the family, and other social institutions. Customarily, they are learned neither on the job nor through vocational training; however, increasingly, firms are initiating basics skill training, and technical colleges are providing remedial basic skills training prior to initiating students into vocational degree programs (Interviews). When weaker preferences are considered, the gap for more technical skills rises; but, in general, the skill gaps that these firms perceive themselves to be experiencing are not of a kind that technical college printing programs can meet easily.

Also, it is apparent that Type III firms experience the greatest gap between their skill needs and those possessed by the potential labor supply. These firms are more likely to consider general-organizational and technical printing skills to be important in addition to attitudinal and basic skills, and since they often are less able to provide formal workplace training due to limited resources and personnel, it appears that these firms are most in need of assistance by the technical college system. While the survey data indicate that it is mostly Type III firms that fall within this category, interviews indicate that Type II and Type IB firms (large firms that are moving toward a more team-centered form of work organization), which generally also have high demand intensities, are experiencing skill gaps as well. While Type II firms face a gap concerning specific technical skills, Type IB firms are concerned with general-organizational skills.

Table 4-1.
Methods of training workers, by firm type[a]
(percentage of employers answering "often"[b])

	Type I (n = 21)	Type II (n = 7)	Type III (n = 31)	Type IV (n = 30)	Total (n = 89)
Formal orientation	62	57	58	33	51
Formal in-house	43	71	45	37	44
On-the-job	95	100	84	83	88
Technical college courses	10	0	6	0	4
Graphic Arts Institute	10	29	10	0	8
Apprenticeship	19	57	19	3	17
Equipment-vendor supplied	10	14	19	20	17
Customized training	5	0	16	0	7

Source: 1991 "Emerging Skill Needs" survey.

[a] Columns do not add up to 100% because respondents could check more than one box.
[b] Choices were "often", "sometimes", and "never".

4. Skilling Strategies

4.1. Training of entry-level workers

Training provided for entry-level workers varies considerably across firms. In the press and bindery area, this ranges from basically no entry-level training to a full, company or joint union-firm sponsored apprenticeship of four to seven years. Survey respondents indicated that on-the-job training (OJT) is the most common method of training used by employers. Almost all employers use this method often (88 percent of survey respondents), although many combine it with other methods. More than 50 percent of respondents often provide formal orientation training to new employees (see Table 4-1).

Those firms that provide little or no initial training are usually those that have strong internal labor markets and rely heavily or exclusively on OJT. In these cases, most workers are hired at the entry level, starting in general utility positions. Many firms hire people that were originally employed as temporary workers in the bindery, doing very basic, manual labor. If they appear to have an interest in the industry, or if they have a "good attitude" or good attendance, they may be hired into a general laborer position. From there, through OJT, they learn what is necessary to move up to the next position, for example, a "jogger" position in the press area. The worker would then be a jogger for several years, learning what is required for the next higher position on up through second and first press operator.

Other firms have adopted systems of extensive training for entry-level workers. New employees may go through a union apprenticeship, which usually includes some training from outside sources, or a company apprenticeship-type program that could also involve outside training but usually consists of formal training at the workplace. Most of the apprenticeship training occurs on-the-job, but usually in a way that is more structured. For example, some company apprenticeship training programs require all new employees to spend a week working in each department. Other firms have all new employees complete self-administered computer tutorials (Interviews).

Type IB firms are more likely to have formal entry-level and continuing training. In addition to technical training, they provide training related to organizational structure and culture, team concepts and communication, and process management. Some Type II firms have begun to provide their sales staff with technical training, including "hands-on" experience, so that they have more complete knowledge and are better prepared to meet customers' needs.

Larger firms, including large trade shops, are most likely to provide more extensive and more formal orientation training due both to greater financial resources and larger numbers of entry-level workers. For smaller and medium-sized firms, the training of entry-level workers is more likely to be geared toward the needs of particular workers because there are relatively few of them. These situations may involve sending employees to seminars or simply having them learn through OJT.

Table 4-2.
Employment of and satisfaction with technical college graduates, by firm type

	Type I (n = 21)	Type II (n = 7)	Type III (n = 31)	Type IV (n = 30)	Total (n = 89)
Have hired a technical college graduate	86%	57%	84%	63%	75%
Very satisfied	28%	25%	38%	21%	30%
Somewhat satisfied	67	75	54	53	58
Not satisfied	6	0	8	16	9
Don't know	0	0	0	11	3

Source: 1991 "Emerging Skill Needs" survey.

Table 4-3.
Reasons why employers aren't satisfied with technical college graduates, by firm type[a]
(percentage of respondents who are not satisfied)

	Type I (n = 6)	Type II (n = 2)	Type III (n = 13)	Type IV (n = 11)	Total (n = 32)
Lack basic skills	0	50	23	27	21
Lack general skills	14	0	54	27	33
Lack specific skills	71	50	31	27	36
Lack motivational skills	29	50	31	36	33
Other[b]	0	0	8	36	15

Source: 1991 "Emerging Skill Needs" survey.

[a] Columns do not add up to 100% because respondents could check more than one box.
[b] "Other" responses include: "too eager to learn the basics and move on"; "slow and uncertain"; "need real-world applications"; "need to understand producing on a timely basis"; "not deadline-oriented, too much emphasis on details and not enough on production."

In the Milwaukee area, employer and union-sponsored apprenticeships include courses taken through the Graphic Arts Institute (a union-management printing school jointly run by GCIU Local 277-M and area employers), and standards are monitored by a joint labor-management committee. However, statewide, the incidence of union- or state-sponsored apprenticeships has declined dramatically over the past several decades. The reasons for this decline are not clear, although one interviewee noted that "the economics of the situation today have changed to such an extent that no longer do printers, among other trades, indenture with the state." First-year apprentices have always been required to spend one day a week learning the trade in a classroom, outside the firm, but in the mid-1970s, the state began to require that firms pay for this coursework. Since that time, the cost of tuition at the technical colleges has been steadily rising: For example, from 1980 to 1990, tuition rose by 57 percent (adjusted for inflation). Employers are more reluctant now to pay for the approximately 20 percent or more of the individuals' time that is spent learning outside the firm (Interview). Seventeen percent of survey respondents often use apprenticeship training, and 24 percent do sometimes.

In large firms, training of new pre-press employees seems to differ from that of press and bindery workers because there are few unskilled jobs in pre-press. Also, there is not the same well-defined job/training progression, with lag time to learn on-the-job, as exists in the press and bindery areas. Workers may start in proofing and then move to scanning, but each occupation is more or less distinct. However, training for new pre-press workers also ranges from no formal training provided to apprenticeship systems.

Regarding technical college utilization, 75 percent of the respondents have hired technical college graduates at some time. Of these, 30 percent were very satisfied, 58 percent were somewhat satisfied, nine percent were not satisfied, and three percent could not evaluate (see Table 4-2). Those who were not satisfied were fairly evenly split in their reasons: Twenty-one percent were not satisfied due to the graduates' lack of basic skills; 33 percent due to a lack of general printing knowledge; 36 percent due to a lack of specific skills; 33 percent due to a lack of motivational skills; and 15 percent for other reasons (see Table 4-3). Respondents elaborating on these other reasons mostly indicated that technical college graduates lacked an understanding of "real world" applications of their knowledge.[18]

4.2. Retraining of incumbent workers

Retraining is of varying importance to different firms. Those firms with strong internal labor markets may rely on OJT for "retraining." These firms often use seminars or specialized training programs if a severe need for retraining arises, such as the introduction of a new piece

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[18]The technical college system's *1988-89 Employer Satisfaction Report* provides employer ratings for a number of dimensions. An average of these ratings shows that 40 percent of respondents rated their employees with technical college degrees as "excellent"; 40 percent as "good"; 17 percent as "average"; 2 percent as "poor"; and 0 as "very poor".

Table 4-4.
Methods of training workers, by firm type[a]
(percentage of employers answering "never"[b])

	Type I (n = 21)	Type II (n = 7)	Type III (n = 31)	Type IV (n = 30)	Total (n = 89)
Formal orientation	14	43	23	47	19
Formal in-house	19	14	29	40	29
On-the-job	0	0	3	13	6
Technical college courses	24	57	29	73	44
Graphic Arts Institute	24	28	39	70	45
Apprenticeship	43	43	65	70	60
Equipment-vendor supplied	19	57	29	60	39
Customized training	81	57	74	90	80

Source: 1991 "Emerging Skill Needs" survey.

[a] Columns do not add up to 100% because respondents could check more than one box.
[b] Choices were "often", "sometimes", and "never".

of equipment, or moving workers into new positions. Firms of all types use vendor-supplied training when they make major equipment purchases.

Many union firms and some nonunion firms rely on the Milwaukee Graphic Arts Institute for retraining, through general courses and customized training. Approximately eight percent of survey respondents use GAI courses often, and 47 percent use them sometimes.[19]

Other firms have hired their own dedicated internal trainers for retraining. Forty-four percent of survey respondents use some form of formal in-house training. Type IB firms are more likely to have trainers due to the importance not only of retraining in technical skills, but for human relations, communication, and other training related to the implementation of new, more team-oriented forms of work organization. Type II firms that constantly update their technology understand the need for continuous training, rather than retraining, and may have their own dedicated trainer as well. Retraining varies: The trainer essentially may organize internal customized training as necessary, or there may be a formal system of classes.

Some firms utilize customized training programs from various providers.[20] Although only four percent of survey respondents use technical college courses often, 52 percent said that they use them sometimes. Only one firm responded that they receive customized training from a technical college. However, other firms have worked with technical colleges to develop literacy centers, classes, and special programs (Interviews).

Some firms use the customized training provided by trade associations, such as the Printing Industries of America or PIW, the National Association of Printers and Lithographers, and the Graphic Arts Technical Foundation. This training primarily consists of short-term seminars or conferences. Some in-plant and franchised quick-print shops receive training from their corporate offices.

Customized training is the form of training that most respondents never use (see Table 4-4). Some of this may be due to unavailability (25 percent of those who answered "never" would like to receive it), but it also may be due to a lack of familiarity with customized training. Apprenticeships and GAI were also methods of training that many employers never use, but use of these two methods is highly correlated with unionization: On average, union firms use these methods often; nonunion firms sometimes or never use them.

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[19]Only people already employed in the graphic arts industry may enroll in GAI. All students pay a $15 registration fee plus tuition. For those students who work for a contributing employer and are in Local 277, the fee is $10 per course. For Local members who are in non-contributing shops, the fee is $60. All others pay $260 per course.

[20]Customized training differs from conventional vocational education in that the training provided is designed to train a particular employer's employees, rather than training individuals for the labor market in general.

Table 4-5.
Credentials sought in new production employees, by firm type[a]
(percentage of respondents answering "usually"[b])

	Type I (n = 21)	Type II (n = 7)	Type III (n = 31)	Type IV (n = 30)	Total (n = 89)
High school diploma	86	71	87	77	82
Apprenticeship certificate	10	43	35	37	30
Technical college degree	14	29	23	17	19
Work experience in printing	48	57	61	70	61
Work experience in related industries	14	0	3	7	7
Bachelors degree	0	14	6	0	3
Other	5	0	6	7	6

Source: 1991 "Emerging Skill Needs" survey.

[a] Columns do not add up to 100% because respondents could check more than one box.
[b] Choices were "usually", "sometimes", and "never".

4.3. Hiring of skilled workers

Although many firms acknowledged that it is desirable to hire people who have printing experience, many also acknowledged that this rarely occurs, because skilled workers are in short supply. One interviewee claimed that their "first priority would be to hire someone with experience, but you just aren't going to find skilled press operators." Type IV employers are most likely to prefer that new employees have work experience in printing, although this was considered desirable by employers of all types (see Table 4-5). Some firms will use contacts through the technical colleges or printing associations to locate available, experienced workers. Much of the inter-firm movement is due to the employee leaving a particular region, and therefore, printers will use contacts to hire that worker (Interview).

"Poaching" does not seem to be a concern in this industry. Firms do not refrain from training because they fear losing their investment as a result of employee turnover. Although some interviewees stated that poaching does occur, no one noted that it was a major problem. Usually, those firms that train their workers are also desirable places to work for other reasons. Type II and Type III firms that rely on networks and subcontracting may not want to risk poisoning these relationships: "You can't steal people from someone you do business with" (Interview). One interviewee commented that they most often lose workers to nonprinters -- other firms in the area that were able to pay higher wages.

Beyond the entry level, turnover is quite low for all types of firms (except for small commercial and quick printers) indicating that most skilled workers remain with their employers. Only about 10 percent of survey respondents indicated that they had difficulty retaining skilled workers, and those that did were primarily Type IV firms.

The other method used to acquire trained workers is to hire employees that have received their training through schools. Type II firms have the highest level of education on average, and they are more likely than others to prefer employees with technical college degrees or bachelor's degrees in graphic arts, design, or computer science.

4.4. Summary of skilling strategies and training provision

What is striking about the overall picture of printing firms' skilling strategies is the low reliance on outside training providers. Most training, whether it is formal or informal, is provided in-house.

Type II firms are most likely to provide in-house training, but they are also the most likely to utilize outside training. Although this is somewhat correlated with a higher rate of unionization, and therefore greater utilization of GAI courses and apprenticeships, it is also related to the fact that Type II firms place a greater emphasis on general-occupational and specific skills than do other firm types. It makes more sense for these firms to train employees, because the highly technical skills they require, which are learned only through significant work-

Table 4-6.
Ways in which the technical colleges could provide assistance, by firm type[a]
(percentage of employers answering "yes")

	Type I (n = 21)	Type II (n = 7)	Type III (n = 31)	Type IV (n = 30)	Total (n = 89)
Increase enrollment	19	29	16	23	20
Create new programs	33	0	35	10	24
Literacy centers	24	0	13	10	13
On-site training	19	14	32	27	26
Customized training	33	29	45	17	31
Other[b]	14	14	6	17	12

Source: 1991 "Emerging Skill Needs" survey.

[a] Columns do not add up to 100% because respondents could check more than one box.
[b] "Other" answers include the following: From Type I respondents: "provide basic skills training in prepress", "continue auto/cad training", "quality control classes"; From Type II: "keep current with emerging technology"; From Type III: "advanced/on-going technical training", "more pressroom and bindery, less emphasis on prepress"; From Type IV: "train more accurately for real-world", "increase practicals of speed printing", "tech school correlations to 'real-world' applications", "more Saturday tech training programs."

based experience, are not likely to be learned elsewhere. The only alternative would be to "poach" previously-trained workers, but the supply of trained workers is particularly low in this technologically-advanced, rapidly-changing end of the industry, and firms are reluctant to damage interfirm relations by poaching.

Type III firms may be facing the most difficult training challenge, as they require a high level of skill, but have few resources to train. Their smaller size makes training difficult and expensive, as they often do not have enough employees to justify the cost of a full-time trainer or formal courses. Some employers have coped with this by obtaining customized training through various sources. Most respondents that use customized training often are Type III firms, and almost half of Type III respondents would like to receive customized training from the technical college system (see Table 4-6).

Type IV firms are the least likely to provide training overall, and they are more likely than other respondents never to use any form of training. Type IV firms face problems similar to those of Type III firms -- a small number of available staff and few resources with which to train. With lower skill requirements and few training resources, little training is provided. This may be a factor in explaining why almost one-quarter of Type IV firms reported difficulty in retaining skilled workers.

To understand the skilling strategies of Type I firms, it is important to disaggregate the two subcategories, since training varies greatly among them. Type IA firms rely heavily on OJT for training. Some Type IA firms rely on the GAI for retraining and apprenticeship training, and some have worked with technical college providers to develop customized training. Since these firms are large and have enough employees to justify dedicated courses, they are more able to use these sources than other employers, although their utilization rate is not high. One area of training that Type IA employers are becoming more interested in is literacy centers: Over one-quarter of Type I respondents felt that this would be a way in which the technical college system could offer them assistance, and some firms already have established basic skills centers with technical college support (Interviews).

Type IB firms are exploring new methods of training that will increase productivity, worker morale, and help them to maintain their competitive edge. Trainers in these firms envision broad, holistic training throughout the system, including improving industrial arts and co-op programs in high schools, strengthening technical college programs through more faculty internships and firm-technical college system linkages, and providing a wide range of training at the firm. Some of these firm-provided training methods include literacy centers; formal classes; company apprenticeships; training centers with self-administered tutorials, videos, and manuals; competency-tests; company seminars; and career counseling services. Most of these training efforts are relatively new, so it is not yet apparent which methods are the most effective.

5. Problems in the Delivery of Training

Many interviewees complained of general societal attitude problems that hamper the delivery of training. Parents are pushing their children to go to college, and the industrial arts are being ignored. In many cases, parents do not have sufficient knowledge to provide information or assist their children in choosing careers. Many people commented that, in general, people are less dedicated to work, don't apply themselves, and are too eager to move to the next job, "thinking the grass is always greener" elsewhere (questionnaire).

Most people in the industry feel that the K-12 system is failing to educate students. This view is held not only by many employers, but by some of the technical college faculty as well. Many believe that the technical colleges are having to waste a lot of their time teaching students the basic reading and math skills that they should have learned in high school. One interviewee remarked: "You can't build a quality vocational education program without quality in the high schools. Something has to give. We need holistic quality across the board." A technical college instructor noted that about 80 percent of the students had to go through the remedial basic skills program that the technical college runs before starting the printing program (Interview).

Several interviewees lamented the decline of industrial arts programs in the high schools. Due to increased requirements, budgetary constraints, and other reasons, the industrial arts programs have been cut back severely. Interviewees noted that education policy has de-emphasized the practice of trades and the working world in general due to the "everyone has to go to college" mind set. There is a need to direct state education policy "toward the skills and knowledge necessary to make a living in today's economy" and the schools should "focus on imparting psychomotor skills and further provide for cooperative training to cement this [technical] training" (Interviews). A few people noted that even in cases where printing programs exist, the faculty is not always qualified, since they only need to be certified in industrial arts, rather than in printing specifically. At one time, around ten to twenty years ago, there were strong industrial arts programs in printing, and many high schools acted as feeding grounds for employers. There are still some good programs left; in fact, interviewees at one firm felt that graduates from the Sussex-Hamilton printing program could place out of almost all associate degree printing courses. However, even these quality high school programs often do not have enough funding. For example, one high school has a scanner, donated by industry, but does not have the money to operate it (Interview).

Some employers worry that they are getting marginal employees today:

> [Employers] will hire someone off the street indiscriminately for a jogger position, and other entry level jobs. When an opening comes up they will hire this person, who was most likely in the bottom quarter of their high school graduating class, and marginally able to pass the general aptitude test, and move [him or her] up into higher levels, higher wages. These people are more likely to find their way into the top positions in the industry than the good people.

One interviewee remarked: "We're always going to get low-end people, but we also need a larger share of the middle chunk of people." Part of the concern is that the State has mandated so many requirements that high school students no longer have the time to do other things, such as cooperative programs: "Only those who are 'low achievers' -- the non-college bound -- have time for other things" (Interview).[21]

The industry believes that it has an "image" problem -- one interviewee remarked that printing is one of the most misunderstood industries. The printing industry is still thought of as a factory work, where workers use old-fashioned letterpresses and hot type. Although many jobs are still factory jobs, a large proportion of the industry is becoming "white-collarized." Some firms, particularly pre-press shops, have office-like environments, with carpeting, offices, and desks with computer monitors. Those in the industry believe that it is hard to get the message out to students that there are good jobs in printing because of the decline in high school and other programs that familiarize students with industry.

Unions as well as employers both feel that they fail to adequately convey a true picture of the industry and its benefits to the public. One GCIU official stated, "We have a problem attracting quality people because the industry doesn't promote itself well -- both union and management. We need to sell ourselves, to let people know that workers in a union shop can earn a good living if they are willing to commit themselves to the industry."

Several technical college faculty members noted that part of the image problem was due to the lack of resources available to educate and recruit at the high school level. The industry must compete with other employers that are promoting themselves to students at job fairs and in the schools. Since there are no requirements or admission procedures for the technical college programs, many students enter the printing programs not knowing what they are getting into. A faculty member at one of the technical colleges said that he asks students why they entered the printing program, and over half say it was because of the high placement rates and high wages they could earn.[22] However, if students choose the program without any knowledge of printing and then later decide that they do not like it and drop out, they have wasted a space that someone more interested in printing could have used. For example, at the Madison campus, the number of applicants always exceeds the available slots.

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[21]These complaints are not unique to printing, but are similar to those heard throughout manufacturing in general.

[22]The *1988-89 Graduate Follow-up Report* shows that graduates of the printing programs have placement rates that are approximately the average for technical college graduates. Overall, 93% of graduates were employed, and 87% were employed in a field related to their major. For graphic arts graduates: 91% of those with an associate degree were employed, 84% in a related field; 94% of those with a one-year vocational diploma were employed, 90% in a related field; and 100% of those with a two-year vocational diploma were employed, 88% in a related field. Regarding placement wages, see section 6.2.

Some industry analysts also noted the shortsightedness of top management on training issues:

> CEOs, owners, etc. are receiving important signals everyday--on OSHA, taxes, the environment, national and local requirements, etc. You can only hit them on this when they are interested in hiring. Trying to convince a CEO of the importance of training is no easy task. It's a delayed time bomb. They will hire someone if they have two eyes and can breathe and then find that they don't have the skills. If they aren't hiring, they don't see the problem, and then it's too late when they need to hire. Reports don't reach them. The leaders need to recognize the changes early on and get ahead of the crowd (Interview).

Some trainers noted that they have been limited in what they can do because they do not always receive full support from those above them.

6. Critical Institutional Linkages

Relations between actors fall into three major axes of coordination: public and private, business and labor, and collective action among firms. The following sections provide a discussion of the current status of these linkages.

6.1. Public and private

Overall, firms' relations with technical colleges are good. However, opinions on the technical colleges varied considerably, ranging from "I am very pleased with our relationship with the technical college" to "We would prefer to hire anybody over a technical college graduate," and from "The technical college is way behind in technology," to "The graduates from technical colleges come in wanting to work on the latest equipment, and we just don't have that here" (Interviews).

Many interviewees had opinions about the quality of different schools. Several believe that the Madison program is the strongest, whereas Fox Valley used to be about 10 years ago. An interviewee noted that the Madison program has "come a long way in the past ten years" and has become attuned with industry's needs. Another interviewee commented that the Fox Valley program has improved in the last few years, and that "they can do things if you give them a chance." In flexography, there seems to be no question that Fox Valley has one of the best programs in the nation.

Satisfaction with the general quality of different technical college programs varied based on firms' level of technology, need for training, and hiring practices. Many firms cannot accurately assess the quality of technical college graduates or programs because the number of graduates that they hire is so small. On average, only 13 percent of production employees in a firm have a technical college degree, and the median percentage is only 6.9 (see Table 6-1). Many firms, when responding to questions about their satisfaction with technical college graduates, were providing answers based on only a few individuals -- especially among Type IV employers (see Table 6-2). This may explain why the reasons employers gave for not being satisfied with graduates appeared to be so random.

There was consistency in the responses of those Type II firms that are on the cutting edge of technology: They have found that the technical colleges are not keeping up in terms of their equipment. One interviewee noted that training at the MATC (Madison) is so weak that it is a detriment, and that they "would take anybody, even someone off the street" rather than an MATC graduate. One firm said that they offered MATC the use of the firm's facilities and advanced equipment, but the MATC never pursued it. The Milwaukee and Fox Valley campuses have recently started desktop publishing programs, which they have found to be in great demand.

Type IA firms are somewhat ambivalent about technical college graduates as new hires.

Table 6-1.
Percentage of production workers with technical college degrees, per firm, by firm type

Firm Type	Mean	Median	Minimum	Maximum
I	9.6	5.9	0	40
II	14.7	7.5	0	50
III	15.1	11.0	0	40
IV	11.9	0.0	0	57
Total	13.2	6.9	0	57

Source: 1991 "Emerging Skill Needs" survey.

Table 6-2.
Number of production workers with technical college degrees, per firm, by firm type

Firm Type	Mean	Median	Minimum	Maximum
I	16.8	7.5	0	68
II	5.5	3.0	0	15
III	5.1	3.4	0	19
IV	0.8	0.0	0	4
Total	6.6	2.0	0	68

Source: 1991 "Emerging Skill Needs" survey.

Since these firms hire almost exclusively at the entry level and then train through on-the-job training or apprenticeships, the skill levels of entering employees are not as crucial as they are in other firms. Also, both heat-set web-offset and flexography firms of this type want their workers to be trained on the huge, high-speed presses that the technical colleges simply cannot afford nor have the space to house, although the flexography training press at the Bordini Center of the Fox Valley Technical College is a notable exception. Type IA firms may rely more on the technical college system to provide customized training, and some have worked with the system to develop workplace literacy centers.

Type IB firms are more concerned with the quality of the technical college graduates. Since these firms do provide their own training, they feel that hiring a trained person would ease the burden of firm-provided training. The reduction in firm-provided training is a crucial interest to many employers.[23] Because these firms have a more team or organization-centered form of work organization, they would like the technical colleges to provide more training in process management and communication, group interaction, and human resources. Furthermore, since the management of these firms think that training is so crucial, they generally also are interested in customized training and workplace literacy centers.

Type III firms are not as likely to hire graduates directly out of school, because their preference is to hire someone who has had both formal training and work experience. In this instance, the firm may rely on the technical college faculty as a type of employment referral service -- asking the instructor for names of people who might be looking for jobs. These employers are likely to believe that although the technical college programs are satisfactory, they need students to have more "real-world" experience before hiring (Interview). This is because these firms are smaller, and don't have the resources or time to wait for the new employee to learn how to operate larger presses, or to learn to work quickly enough. One survey respondent wrote: "We need experienced printers, not trainees." Type III firms are also interested in customized training programs, although their smaller size often inhibits their ability to partake in certain programs because they cannot afford to let critical employees take time off from work for training and they do not have sufficient numbers to justify dedicated classes.

The need for employees with work experience is of interest to most Type II, III, and IV employers. Many expressed interest in internship programs that would give students work experience. One employer wrote: "How about having students apply for part-time work at print shops for some 'real-world' experience?" Another wrote that the technical college training was too general and that "at least two semesters should be specialized and incorporate a co-op program."

Some employers expressed concern about technical college faculty training. One survey respondent wrote that the "instructors in area schools not qualified. Students acquire bad habits." Many employers would like to see more faculty taking internships at firms during the

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[23]The technical college system's *1988-89 Employer Satisfaction Report* shows that 79 % of graphic arts employers responded that the vocational education received by the employee shortened normal on-the-job training time.

summer. Although this occurs to some degree, there are many impediments to this occurring more often. First, faculty who are on nine-month appointments often have long-term summer job commitments, which they do not want to give up for a one-time internship. Second, even those that do have twelve-month appointments are usually too busy teaching to take time off. One instructor commented that the faculty is so busy, the only way they have been able to keep up in the field is because some of the instructors make graphic arts their hobby.

When asked in what ways the technical college system could help employers with their training needs, 31 percent of survey respondents indicated that customized training programs at the college site would be helpful (see Table 4-6, page 50). Twenty-six percent requested on-site training in specific skills, and 24 percent felt that the technical college system needs to create new programs in their area, such as flexography, screen, and DTP. The need for a DTP program seems strongest in the Madison area, while a need for training on bindery equipment seems to exist throughout the state. Some interviewees commented that the Waukesha Area Technical College runs graphic arts courses through the continuing and adult education school, but that there is no official printing program, so students cannot receive degree credit for taking those classes.

For many employers, hiring of technical college graduates is constrained by their location. Since printers are spread throughout the state, many are located in regions where no printing programs exist. This is especially a problem for screen and flexography printers, since there is only one of each type of program in the state. Six respondents would like to see new programs developed in screen printing, and five respondents requested new flexography programs. Five respondents were also interested in high-volume web press programs. Unfortunately, location is a problem for all of these requests: Respondents desiring these new programs were spread throughout several regions.[24]

Twenty percent of the survey respondents felt that higher enrollment in existing programs would be helpful. Many interviewees also agreed that existing enrollment should be augmented, since the number of technical college graduates to overall hires is merely "a drop in the bucket." A technical college faculty member mentioned that one of the company trainers commented that "hiring MATC (Madison) grads is like the NFL draft." Requests for graduates usually far exceeds the number available -- for example, in 1989, there were 211 requests for the 38 graduates from the Milwaukee Printing and Publishing Associate Degree Program.[25] One technical college instructor cautioned that is would not be easy to increase enrollment much while maintaining the quality of the program graduates: "There are only so many people to

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[24]The requests for new programs in screen printing were: four from the Gateway region, one from the Fox Valley region, and one from Western Wisconsin. Requests for flexo programs came from: one from the Milwaukee area and four from Northeast. Requests for high-volume: two from the Milwaukee area, two from the Madison area, and one from Mid-State.

[25]The 211 requests for Printing and Publishing graduates was exceeded only by requests for Information Processing (443 requests), Registered Nurses (354), and Welding Technology (215).

draw from, and we are already looking at the bottom people, those who didn't go on to college." Some interviewees noted that the programs simply need more money, space, and equipment to be able to increase enrollment.

Some survey respondents mentioned that there is not enough available information on technical college programs and graduates. One person wrote: "Industry needs more information on summer interns and emerging graduates." Two employers responded that they did not know about technical college programs.

There have been attempts at cooperative efforts between different colleges and printers to form new programs, as needs arise. This has met with mixed results. A few years ago, the printing staff at the Madison campus worked with area printers to establish a high-volume printing program. Although members of industry and faculty spent a great deal of time and effort designing the program curriculum, the program was blocked at a higher level of the college and never implemented. However, a positive result occurred in screen printing. About a year ago, due to dire need, some screen printers got together to work with the Moraine Park campus in creating an Industrial Screen Printing program. Firms donated the equipment for the new program and will offer internships to program participants. The program will enroll its first students in the fall of 1991. Relations appear to have been very good on both sides throughout the process (Interview).

Positive results have also occurred in Milwaukee, where the Occupational Advisory Committee suggested that the school create a new advisory committee for desktop publishing (DTP). The committee was formed and, with the input of the staff and industry representatives, a DTP program was created. The staff at the Fox Valley campus also recognized a need for DTP and has established a state-of-the-art lab. Efforts also are being undertaken in Fox Valley to start a competency-based computer lab program, where firms could send their employees to learn through self-paced tutorials, with faculty on-hand to provide assistance as needed. This would be especially helpful for smaller and medium-sized firms that do not have the resources to provide their own training. In addition, the nature of the tutorials would be such as to provide flexibility to participants in the scheduling of training.

6.2. Business and labor

In general, relations between management and unions in the printing industry seem to be good. This may be due to the growth the industry has experienced that has helped printers to weather recessions much better than other industries. It may also be due to the nature of the industry where a number of managers and owners of companies were once production workers and union members, and therefore may be more understanding of labor's needs.

Post World War II, the Milwaukee Institute of Technology (the technical college) provided the in-class component of apprenticeship training for the formal state-sponsored program in the Milwaukee area. A labor-management committee oversaw the curriculum for

dedicated apprentice classes through the mid-1960s. When the "rule of 12" was established, requiring a minimum of 12 students per class, there were no longer enough apprentices to justify dedicated classes for apprenticeship training, and apprentices were placed in the associate degree classes for their one day per week school component. The union felt that the associate degree classes were at a much lower level and were causing "disaffection . . . apprentices were tuning out" because the classes were not challenging enough (Interview). In 1966, the GCIU (then LPIU) Local 277-M began bargaining for training and education funds to establish the Milwaukee Graphic Arts Institute (GAI), which opened its doors in 1972 (also known as the Union School, or The Institute).

The Institute is run jointly by union and management -- the board consists of three labor representatives, three management representatives, and one director. There are currently 24 contributing employers, of which all but one are unionized, and all but one employer are located in the Milwaukee area. Contributing employers are assessed a per capita fee, based on either the number of union members or number of production workers, and the school receives education contributions for 1300 union members (Interview). The firms that use GAI, both for apprenticeship courses and retraining, seem to be very happy with the school (Interviews). A trainer at one firm said that the GAI was probably the best printing school in the country. Firms outside the Milwaukee area have used GAI instructors and facilities for customized training: In one case the firm turned to GAI because the personnel and facilities at the area technical college printing program were insufficient to meet their retraining needs (Interview).

An interviewee said that few technical college graduates go into union shops, because the graduates would have to start out in entry-level jobs with little or no chance to utilize their education. Interviewees at several union firms offered support for this view when stating that they hire few, if any, technical college graduates, and that they make no effort to hire them.

It appears that relations between management and Local 277-M continue to be good "except, of course, during contract negotiations" (Interview). Both union and management indicated that the GCIU does not object to new technology and is supportive and encouraging of training efforts. GCIU Local 382 in the Fox Valley region is also concerned about (re)training. Although employers and educators also seem to be concerned, there has been difficulty coordinating any joint action, and training has been more ad hoc. Local 382 asked other area locals if they would be willing to participate in joint training workshops, but there has been no interest (Interviews).

Workers belonging to the ITU/CWA, which represents typesetters, are more defensive concerning new technology. The ITU has resisted installation of DTP, which replaces conventional compositors and typesetters. Basically, DTP holds the potential of eliminating their jobs, particularly as more and more customers do typesetting in-house.

Some union officials indicated that they feel there was no "skills shortage" in the industry, but rather that employers are unwilling to pay sufficient wages to obtain quality people. Insufficient wages were also blamed by some unionists as well as technical colleges instructors

for difficulties hiring and retaining entry-level workers: "The industry needs to get the starting wages higher to attract better people, because most starting wages aren't high enough to support a person, especially if that person has a family." Other unionists did not think that wages were a problem, and suggested that the problem in attracting high-quality entry-level workers was due to the industry's "image" problem (Interviews).

The overall picture on wages in the industry is unclear, due to the diversity of firm types, occupations, and regions. According to the technical college's *1988-89 Graduate Follow-up Report*, the median monthly salary for graduates from the graphics programs is less than the median monthly salary for all Wisconsin industries and occupations, as well as less than the median monthly salary for all technical college graduates (see Table 6-3). It is generally acknowledged that wages improve greatly as one moves up the ladder, although one industry analyst noted that wages have not been keeping up with inflation over the past five years, in both union and nonunion shops (see Appendix II. for more information on wages).

6.3. Collective action among firms

In general, the relations among firms in this industry seem to be very open and cooperative. Lithography is a well-known process, so there are few technological or production secrets. One interviewee described the situation as a "competitive brotherhood," while another said "the amount of friendly competition is high." On the whole, most employers acknowledged that relations with other firms were good, and a significant amount of subcontracting occurs.

There are many employers associations and clubs, and most firms belong to at least one. The largest state employers' association is Printing Industries of Wisconsin. Some of the more social clubs include the Craftsmen's Club of Madison and the Litho Club of Milwaukee. Employers meet for social dinners and technical presentations once a month. These associations are seen as clearinghouses for technical information as well as a conduit for information about other firms' capabilities, which is useful for subcontracting and referral purposes.

Employers reliance on and contact with other firms often depends on their size. Type IA and IB firms often subcontract certain aspects of production to local, smaller printers or trade shops, with whom they maintain longstanding ties. Although they may have national markets as well, ties to other firms are important for Type II firms, being trade shops. Type III firms are extremely dependent on one another. These firms are likely to depend on each other to provide extra supplies, like paper or inks, in a pinch when they run low. Also, since they usually specialize in certain processes, Type III firms may refer customers to other printers when they cannot do a job. One interviewee spoke of going to another printer's shop to do jobs when his firm did not have the appropriate equipment. The ties that these printers maintain are maintained through the employers clubs, as well as personal relationships. Since the printing industry is somewhat of a family business, many people know each other and each other's families.

Many employers expressed an interest and willingness to work with other printers in establishing programs that would be helpful to themselves and each other, such as training programs, internships, and promoting the industry (Interviews). Although most firms do not want to waste much time on training programs that do not train on similar equipment to their own, most realize that they do not have to restrict the training to equipment exactly like their own. For example, training on any major brand scanner is almost as good as training on the particular scanner a firm uses (Interview).

The potential for cooperation is greatest among offset printers, because lithographic technology is mainstream. Firms using other processes, such as screen and flexography, are more closed, since technology is still evolving and there are more trade secrets. However, there are examples in both screen and flexography where the need for training has overcome any need for secrecy. Screen printers came together in the development of the Moraine Park program in Industrial Screen Printing. Firms realized that cooperative action was necessary to design the program and get it off the ground. Flexographic printers have been very generous in donating equipment to the flexography program at the Bordini Center. Even if there are "secrets" in the industry, they are not great enough to prevent employers from sending their employees to seminars and training programs with other firms' employees.

7. Conclusions and Recommendations

1. The printing industry is of extreme importance for the Wisconsin economy. Printing is one of only a few manufacturing industries in the State with a significant rise in employment over the past decade. At the same time, the industry is highly heterogeneous -- with very large and very small firms serving increasingly differentiated product markets -- and in particular its technology use, work organization, skill demands and training practices are far from uniform. This poses a formidable challenge for the technical college system as the State's public provider of vocational training.

2. At the cutting edge of the industry, highly sophisticated utilization of micro-electronic technology is eroding the traditional distinction between manufacturing and services. Customized products are defined and designed in close cooperation with clients, and competitive advantage is gained by educating customers on the full potential of new technology, and by having a skilled workforce. Firms in this segment of the industry require both broad and high skills: broad, because their workers need to understand the printing process as a whole and must be able to interact closely with customers to help them define their more diversified needs, and high, because workers must be capable of operating very complex and expensive new technological equipment. Pressures for upskilling seem strongest at the pre-press stage, but they extend even into bindery where new technology enables printers to diversify their product inside large production runs.

Firms with advanced technology, but also more conventional medium-sized firms, often carry out only part of a larger job and contract with other firms for the remaining work, thereby creating complex patterns of inter-firm cooperation. In this way, firms share technological and market risks and circumvent the need for having the latest, most flexible and most highly advanced technology for all stages of a particular production process. Combining and recombining with other firms for complex tasks is facilitated if a firm has workers with an understanding of the industry that extends beyond the firm where they are employed, and includes an ability to interact with customers as well as with workers from cooperating firms.

3. However, there is also much strategic and technological conservatism in the industry. Probably due to the still growing demand for printed material, large conventional printers seem to get by without dramatic changes in products, machinery, workforce composition, and training practice. Firms of this kind seem to be able to generate the skills they need through various forms of on-the-job training, maintaining unionized or non-unionized internal labor markets where entry is limited to the lowest positions and workers advance with time into more skilled jobs. Unlike more technologically ambitious firms, there is a tendency, albeit not universal, among firms in this category to close themselves off to the external labor market and to the public vocational education system and produce the skills they need internally, sometimes through elaborate in-house retraining arrangements.

Innovation and conservatism are present among both large and small firms. Large firms may be traditional mass producers (Type IA), or they may aspire to be diversified quality

producers (Type IB). In the latter case, they are likely to operate flexible forms of organization, including team-like production systems. Medium-sized to large pre-press shops (Type II) operate advanced technology and require high, industry-specific skills. Medium-sized full-service firms (Type III) use all levels of technology and training, and may be either innovative or conservative. Small print-shops (Type IV) are typically not technological leaders and cannot be due to their size; to the extent that they require high skills, these are of a more general kind due to their low division of labor.

4. Complaints about printing no longer being able to attract a sufficient supply of talented workers are widespread and resemble those heard from other manufacturing sectors: young people prefer going to college, often under pressure from their parents, and manual work is generally perceived as a last resort for individuals with little talent and ambition. Despite such complaints, however, entry-level wage rates are not excessively high in the industry. Indeed, it may be precisely because of the relatively low starting wages that the industry seems to find it hard to attract qualified new entrants. On the other hand, a lack of skilled workers has only rarely in the past decade presented an obstacle to expansion. During a period of rapid growth, even firms at a sub-optimal level of human resource development can survive and prosper. There are, however, signs of contraction in the market for printed materials, potentially signalling a shake-out of those firms that are not in tune with existing technological opportunities and that fail to pursue strategies of competitive upskilling.

5. Most firms, except perhaps for the smallest, do not seem to have difficulties retaining skilled workers. In particular, there seems to be relatively little "poaching" of skilled workers. In part, this may be because skills are often firm-specific, or because outside Milwaukee, Madison, and the Fox Valley region the industry is widely spatially dispersed. More important, however, may be the fact that widespread subcontracting relations militate against firms hiring other firms' skilled workers.

6. Firms' perceptions of the industry's skill supply and of their own skill needs are highly diverse. Employers' present skill demands seem to have two independent dimensions consisting of attitudinal, basic, general-organizational and foundational skills on the one hand, and of general-occupational and industry-specific skills on the other. An employer who regards one of the first four skill types as important is likely to find the three others important as well, just as an employer who demands general-occupational skills is likely to also demand industry-specific skills. When pressed, industry employers indicate strong demands for basic, motivational and social skills, while industry-specific technical skills are ranked lower. Printing being a heterogeneous industry in rapid transition, there is little to no agreement among printing firms on whether the skill level of the industry's present workforce is sufficient to sustain further growth. Moreover, assessments of the skill level of firms' present workforces appear to be highly idiosyncratic, with respondents sometimes ascribing a high skill level to a workforce that has received very little training, and vice versa.

7. The picture is similarly diffuse with respect to firms' own training practices. As in manufacturing generally in the United States, management gives much higher priority to

technology than to human resources, and training tends to be reactive rather than proactive. Traditional apprenticeship has declined sharply, in part because of the rise of non-union firms and in part probably because of the absence of a reliable mechanism to adjust outdated occupational profiles to new organizational and technological conditions. Declining incidence of traditional apprenticeship can be seen as indicating lower willingness on the part of firms to train at their workplaces over long periods and according to standardized curricula. Put otherwise, work-based training, where it is offered by firms, would appear to have become more firm-specific, with in-house "apprenticeships" especially in large firms taking the place of earlier, occupationally-oriented forms of training. An exception of sorts are the proliferating basic literacy programs and certain computer tutorials that do confer non-firm-specific skills, albeit at a very elementary level.

8. The present practice of workplace-based training in the Wisconsin printing industry would appear to have less than desirable consequences for technological progress and labor market flexibility. Tendencies towards autarky in skill formation on the part of large firms, as well as a trends among medium-sized firms to use "customized training", as provided by the technical colleges, to fill narrowly-defined skill gaps on a short-term, ad hoc basis, are likely to result in more firm-specific qualifications that inevitably inhibit labor mobility between firms. Firms and workers with this type of skill pattern are not well prepared to absorb future technological change. Social and attitudinal skills can not make up for a lack of technical skills. To avoid the industry's skill base permanently lagging behind technological developments, workers require broad-based occupational-type skills that enable them to cope with a wide range of upcoming changes on their own and to understand more than just a subsegment of the potential applications of new equipment.

9. The competitive importance for large and medium-sized printing firms of a broad, occupationally-structured technical skill base is likely to increase further as competition in the industry becomes fiercer. If and when the rapid growth of recent years flattens out, those firms that can improve the quality and the customized diversity of their products, accomplishing an ever closer match between their offerings and their customers' demands, will do better and will survive. Similar processes have been observed in other manufacturing as well as service industries, and there is no reason to believe that they will not repeat themselves in printing. As slower growth will shake out weaker firms, one of the questions will be how capacity cuts will be distributed among the regional economies of the United States, or even internationally. There is no doubt that regions that have built up a skilled printing workforce in time, will bear a proportionately lower burden. It will be the responsibility of regional economic policy, and of the technical college system in particular, to prepare Wisconsin's printing industry for this situation.

10. Only a relatively small share of the Wisconsin printing industry's workforce are graduates of technical colleges, although about three-quarters of the firms that were surveyed claim to have at some point hired a technical college graduate. While firms generally are not dissatisfied with technical college graduates, they do not seem to be overly enthusiastic either. Large firms seem to find graduates too broadly trained, and perhaps too demanding, to fit easily

in their carefully structured internal labor markets. At the same time, technologically very ambitious firms find graduates lacking in the latest technical skills. Furthermore, small and medium-sized firms with a low division of labor and a need for all around technical and organizational skills find work experience to be lacking. Apart from this, complaints about technical college graduates exhibit the usual diffuse, almost random pattern, with employers missing basic, general, specific and motivational skills in almost equal numbers.

11. How can a public provider of vocational training like the technical college system become more relevant to an industry like printing which is a key employer in the State and whose healthy development is crucial for the future of the regional economy? The present study has found considerable pressures on technical college districts to provide more workplace-specific and immediately usable skills. There are excellent reasons for the technical college system not to give in to these, the most important being its mission to ensure the long-term adaptability and mobility of the industry's workers, who as citizens contribute a good part of the system's resources, and to mind the industry's longer-term future -- preparing it for more difficult times ahead when overcapacity will have to be eliminated and a flexible, broadly and highly trained workforce will be an important resource in competition with other regional and national economies. At the same time, while the public status of the technical college system should enable and oblige it to look beyond the immediate concerns of employers, it will have to realize that cutting-edge work skills today typically cannot be easily acquired in classrooms and are fostered best in a real-life work environment that allows for simultaneity of productive work and learning.

To fulfill its mandate and help the Wisconsin printing industry adopt the latest technologies and organizational innovations -- enabling it to offer long-term, high-wage and high-skill employment to a large number of citizens -- the technical college system cannot afford to listen exclusively to employers' demands and criticisms. This is so not least since employers themselves are divided, and the signals they give to the public training system are highly diverse, even contradictory, often reflective of long-standing neglect of human resource development as a competitive strategy, and thus on the whole not very instructive. The following recommendations are supported by the present research:

(1) The technical college system will never provide more than a small part of the printing industry's skilled labor, even with considerable expansion of its programs. However, given the size of the industry, its importance for the State, and the likely increase in competition when market growth slows down, such expansion would appear to be an excellent investment and should be forcefully pursued.

(2) The main problem firms have with technical college graduates seems to be their lack of practical work experience. This could be remedied by more extensive use of cooperative training programs that give students an opportunity to work for limited periods of time in a print shop while they are still studying. Firms often demand such programs; they should be taken at their word. To make cooperative training programs more effective, broader and organizationally more stable, they preferably should involve rotation of co-op students among a number of

participating firms. As far as the technical colleges themselves are concerned, cooperative programs can be successful only if colleges find ways to coordinate students' workplace and classroom experiences, and organize part of classroom instruction as supplementary to students' experience at the workplace.[26]

(3) A related recommendation concerns the continuing and further training of faculty. There are strong demands by employers that faculty should acquire a better understanding of what is going on in advanced printing organizations, and determined efforts should be made to organize faculty internships in the companies that they are supposed to serve. Here, too, it will be important for the technical college system to take up present employer criticisms but also to ask employers for help in remedying them.

To effectively implement faculty internship programs, issues of pay will have to be addressed. Since many faculty with nine-month appointments have other permanent summer jobs, summer salaries, either through paid internships or year-long college appointments, would need to be guaranteed to induce faculty to participate in such programs. Responsibility for sharing these costs may need to be worked out with firms. Also, to the extent that the current salary structure rewards faculty for acquiring additional university credits but not for more practical training like internships, the incentive structure of the current pay system may need to be revised as well. Changes in the certification process may need to be considered.

(4) The most important customers of the technical college system and the main employers of skilled entry-level workers in the industry in the future are medium-sized firms, either specialized high-technology pre-press shops (Type II) or full-service printing firms (Type III). Since firms of this size have relatively few resources for in-house training, they depend more than others on assistance from the public sector. It would appear to be an important challenge for the technical college system to offer ambitious medium-sized firms acceptable alternatives to narrow and ad hoc customized training, such as seem to be frequently demanded under the label of "customized training". For example, the technical college system can serve these firms better by producing graduates who have completed broad cooperative training programs that combine classroom instruction with work experience and offer students an opportunity to work in more than one workplace, to get to know different technologies and types of work organization. The success of such programs would rest, among other things, on the willingness of these firms to participate in cooperative training and to refrain from hiring co-op students before they have completed their degrees.

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[26]Currently the State is exploring the possibilities for introducing a youth apprenticeship program in printing. Such a program would require defining industry standards, a relatively stable number of slots available in a range of firms, and articulation between the high schools, technical colleges, and firms. A cooperative program between Waunakee High School and MATC (Madison) initially was successful but broke down when key actors left (Gribble, 1991). A more formal program has been instituted successfully by printers in the San Francisco Bay Area. The program director recruits students from high schools, and then the local employers' association matches students to firms, where they are trained (Petersen, 1991).

In addition, technical colleges should make use of innovations in training technologies to better meet the further training needs of these firms. For example, provision of self-paced computer-based tutorials, with faculty present as a resource, such as the program being explored at the Fox Valley Technical College, would permit training to occur during off-hours. This would be of great assistance to small and medium-sized firms that cannot afford the absence of any of their workers during normal production. Such a program could provide a structured, standardized, and perhaps even certifiable curriculum, as an alternative to firm-specific training.

Medium-sized full-service firms in particular would also benefit from technology transfer programs run out of technical colleges in combination with training programs, drawing in managers as well as workers to keep them up-to-date on the latest technological developments in the industry. In fact, well-organized technology transfer programs may be an optimal way of opening new "markets" for broader, less "customized" training of incumbent workers, as will be useful in increasing the future adaptability of the industry.[27]

(5) Dissatisfaction with the present supply of skills is highest among firms that look for general-occupational and industry-specific skills. It is in this area that the technical college system has the most to offer as well as to gain. Basic, attitudinal, general-organizational and foundational skills cannot really be created by technical colleges anyway; they must be acquired elsewhere, and the system cannot be held responsible for the failure of families, the K-12 school system or employers in generating them.

(6) Growing demands for "customized training", especially among Type III firms, must not be permitted to divert the technical college system's attention from its principal task of generating broad-based, flexible, occupational-type qualifications. In particular, technical college faculty should not have to spend inordinate amounts of time designing ever new and narrower firm-specific or job-specific training programs. Specialized add-on or refresher courses must not crowd out a type of training that incorporates ongoing technological innovations in larger occupational contexts. Efforts of firms to provide firm-specific training and job-specific training themselves, perhaps with the assistance of equipment vendors, should be encouraged; however, they must not be seen as competing with the mission of the technical colleges, which is much broader in scope. While customized delivery of training should be developed far beyond its present state and use -- for example, with respect to remedial training for basic workplace literacy and numeracy -- the curricular and programmatic integrity of the technical college system's offerings must be preserved against demands for more and more firm- or job-specific content.

(7) Generally, training for high industry-specific and occupational skills should be as broad as possible, to insure workers and employers against the unpredictabilities of technical

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[27]Small firms of the "quick-print" type (Type IV) also need and want skilled workers, and are even less able than medium-sized firms to train them themselves. However, there is probably very little the public vocational training system can do for them, except -- again -- produce broad and high-level, all around occupational skills in programs with high exposure to real-life working conditions.

change and, very likely, growing competition. In recognition of the need for workers in advanced printing organizations to have a comprehensive understanding of the printing process, cooperative training programs that integrate work experience and skill formation should cover pre-press, press and bindery work, at least at an elementary level, and only later become more specialized. In principle, the present high heterogeneity of the industry, and the high diversity of its demands on the training system, should encourage technical colleges to maintain broad, general curricula rather than try, inevitably in vain, to catch up with each firm's specific demands. Cooperative programs should therefore try to involve as many firm types as possible, enabling graduates to get to know the industry in its entirety.

In line with the need to preserve an integrated general printing curriculum, it is important that desktop publishing be encompassed within the general printing programs. Currently, some districts teach this technology within their printing programs while others incorporate it into their business programs. There are also pressures to create separate desktop publishing programs.

(8) The technical colleges could make better use of existing resources and training programs. First, the Graphic Arts Institute in Milwaukee has developed a successful program, particularly for retraining incumbent workers. A cooperative program between MATC--Milwaukee and GAI could offer both schools advantages, through equipment sharing and curriculum development. Second, there are training materials being developed by certain groups in the industry. The National Association of Printers and Lithographers (NAPL) and the Carl Didde Corporation have created the WorkPLACE (Work-related Printing Learning and Career Enhancement) program, which offers a manager's sourcebook, workforce skills inventory, and four courses. In Maryland, a community college worked with the Printing Industries of Maryland to apply for a U.S. Department of Education grant to purchase and administer a customized version of the WorkPLACE program.

(9) Defending the technical colleges' programmatic integrity ultimately demands more centrally coordinated curricular decisions, relieving the pressure on local districts to comply with the wishes of large local employers. To ensure sufficient industry input, the State Vocational Education Board should appoint a central advisory committee to the State VTAE Director, with representatives, from both management and labor, of technologically-advanced printing firms of all four types. In selecting the committee, the State Board should make good use of the already existing, relatively high level of cooperation between firms in the printing industry: For example, it should make certain that all of the industry's major trade associations and labor unions are represented. The advisory committee should be given the power to review the work of printing-related advisory committees at the district level. In addition, it should formulate long-term recommendations for the development of industry-related training programs.

Bibliography

Eckhardt, H. Ted. "Offshore Competition: Smoking Gun or Smoke Screen?" *NAPL Printing Manager* Jan/Feb 1989: 18-23.

Fauber, John. "Printers Press On in Tight Market," *Milwaukee Journal*, July 16, 1989: D1.

Forward Wisconsin. "Wisconsin Printing Industry: Craftsmanship on the Cutting Edge of Technology." Madison, WI: Forward Wisconsin, 1989.

Gorelick, Dick. "Marketing Goes Legit." *Graphic Arts Monthly* August 1989.

Graphic Communications International Union. "History of the GCIU." Information sheet. nd.

-----. "The Graphic Arts Evolution." Report on DRUPA '90, 1990.

-----. Membership pamphlet. nd.

Gribble, Roger A. "Tech-prep would give structure to cooperation." *Wisconsin State Journal* October 27, 1991: 11A.

International Paper. *Pocket Pal*. Memphis, TN: International Paper, 1989.

Johnson, Peter. "The Geography of Print." *Graphic Arts Monthly* January 1990.

Hayes, Jack. "Beer Labels to National Magazines: New Worker, Technology Await Growing." *Window* Fall 1987: 8-9.

Karol, Michael. "Facing Change." *Graphic Arts Monthly* August 1990: 53-58.

Malardi, Vincent. "Riding the Trade Winds." *American Printer* April 1990: 38-42.

Marshall, Alan. *Changing the Word: The Printing Industry in Transformation*, London: Comedia Publishing Group, 1983.

Master Printers of America. *Writing Job Descriptions for the Printing Industry*, Arlington, VA: Master Printers of America, 1984.

Milwaukee Area Technical College. "1989 Graduate Employment Report." Pamphlet.

Murphy, Patty. "On the Cutting Edge of Color." *American Printer* April 1990: 50-52.

Petersen, Debbie. "Quick Change Artist." *American Printer* August 1990: 28-35.

-----. "One on One." *American Printer* February 1991: 52-56.

"Printers Upgrade Equipment for the Press of Business." *Printing News Midwest* May 1990: 13.

-----. *Economic Trends*. Arlington, VA: Printing Industries of America, January 1989, June 1989, October 1989, November 1989, February 1990, May 1990.

-----. *Facts and Figures on the Printing Industry, 1989*. Arlington, VA: Printing Industries of America, 1990.

PIW Messenger. *Printing Industries of Wisconsin*, Fall 1990.

Scott, Daniel T. *Technology and Union Survival: A Study of the Printing Industry*. New York, NY: Praeger Publishers, 1987.

Stern, D. and Benson, C.S. "Firm's Propensity to Train," Conference on "An Expanded Role in Job Training: The Issue of Market Failure in the Provision of Public Training." University of Wisconsin, Madison, May 1989.

Study Group of the 1985/1986 Co-ordinated Research Programme. *The Effects of the Development of Micro-technology on the Organisation of Work and on Employment in the Printing Industry*. France: Strasbourg, Council of Europe, 1987.

"Top U.S. Printers in 1989 Annual Sales." *American Printer* July 1990: 52-65.

U.S. Department of Commerce, Bureau of the Census. *1987 Census of Manufactures, Industry Series*. Washington, DC: Government Printing Office, 1987.

-----. *1982 Census of Manufacturers*. Washington, DC: Government Printing Office, 1982.

-----. *U.S. Industrial Outlook 1990*. Washington, DC: Government Printing Office, 1990.

-----. *County Business Patterns 1986*. Washington, DC: Government Printing Office, 1986.

U.S. Department of Labor, Bureau of Apprenticeship and Training. *National Apprenticeship and Training Standards for the Graphic Arts International Union*. Washington, DC: Government Printing Office, 1981.

U.S. Department of Labor, Bureau of Labor Statistics. *Occupational Employment in Manufacturing Industries 1986, BLS Report 2312*. Washington, DC: Government Printing Office, 1986.

-----. *Occupational Projections and Training Data, 1990 Edition: A Statistical and Research Supplement to the 1990-91 Occupational Outlook Handbook*. Washington, DC: Government

Printing Office, 1990.

-----. *Occupational Outlook Quarterly: 1990-91 Job Outlook in Brief*. Washington, DC: Government Printing Office, 1990.

-----. *Occupational Outlook Handbook 1990-91*. Washington, DC: Government Printing Office, 1990.

-----. *Employment and Earnings, States and Areas, 1939-82*. Washington, DC: Government Printing Office, 1987.

-----. *Supplement to Employment and Earnings*. Washington, DC: Government Printing Office, 1989.

Wisconsin Board of Vocational Technical and Adult Education. *1988-89 Employer Satisfaction Report*. Madison, WI: 1990.

-----. *1988-89 Graduate Follow-up Report*. Madison, WI: 1990.

Wisconsin Department of Development. *New Industries and Plant Expansions Reported in Wisconsin*. Madison, WI: 1989.

Wisconsin Department of Industry, Labor and Human Relations. "Employers Covered by Wisconsin Unemployment Compensation Law, 9/25/89." Madison, WI: DILHR, 1989.

Wisconsin Labor Market Information. "Interim Planning Information for Employment, Training, and Development." Madison, WI: DILHR, July 1990.

-----. *Planning Information for Employment, Training, and Development*. Madison, WI: DILHR, September 1989.

-----. *Planning Information for Employment, Training, and Development*. Madison, WI: DILHR, September 1987.

Wisconsin Strategic Development Commission. "Emerging Industries in Wisconsin." Madison, WI: April 1985.

-----. "Printing and Publishing Task Force Report." Madison, WI: 1987.

APPENDICES

Appendix I.
Methodology

Interviews

Eighteen interviews were conducted with employers, union representatives, VTAE faculty, and others involved with the industry. Those interviewed represented ten firms, three technical colleges, and four industry-affiliated groups.

Survey Sampling Procedure

A questionnaire was designed in January 1991 and sent to ten randomly selected printing firms. Four questionnaires were returned, and the responses were used to make clarifications and additions to the survey instrument.

The revised questionnaire was mailed, along with letters requesting cooperation from the Center on Wisconsin Strategy and from Dwight York, State Director of the WBVTAE, to two samples of firms. The first mailing was sent to all firms with SIC codes 275 or 279 that had 50 or more employees (n = 92). These firms were selected from the 1989 Directory of Manufacturers. The second sample consisted of firms with 5 to 49 employees. Firms with less than 5 employees were not included based on the fact that these firms do not face the same skill requirements and training needs as the larger firms. Firms with SIC codes 275 or 279 were selected from the Wisconsin Unemployment Insurance name and address file as of September 25, 1989. A sample was generated of approximately forty percent of the firms (n = 232). The sample was drawn randomly, stratifying by region.

The questionnaires were sent in February and March of 1991. In April, a follow-up questionnaire was sent to all firms not responding to the first mailing. Later in the month, due to time constraints, a follow-up was sent to half of the firms not responding to the second mailing.

Survey Results

The final result was 89 returned completed responses, 13 undeliverable due to incorrect addresses, and 3 returned uncompleted by firms that said they were not printers. The overall response rate for correctly-delivered questionnaires was 29 percent. The breakdown of response rates is provided in Table I-1. Table I-3 provides response rates by VTAE District.

Since the firm typology was not derived until after the questionnaires were returned, it was not possible to draw the survey sample by firm type. All 47 Type I firms were sent questionnaires, and 45 percent of those firms responded (see Table I-2). Fifteen Type II firms were mailed questionnaires, and seven firms responded. Thirty-one out of the 96 questionnaires that were mailed to Type III firms and 30 of the 150 that were sent to Type IV firms were returned.

Table I-1.
Response rates by number of employees

Number of Employees	State total	Number mailed[a]	Number of responses	Response rate	Responses/ state total
50 or more	92	88	37	42%	40%
5 to 49	444	220	52	24%	12%
Total	536	308	89	29%	17%

Source: 1991 "Emerging Skill Needs" survey; 1987 Census of Manufacturers; 1989 Unemployment Insurance Name and Address File; 1989 Directory of Manufacturers; and various association and union membership lists.

[a] Does not include questionnaires returned as undeliverable, or those returned unanswered.

Table I-2.
Response rates by firm type[a]

Firm Type	State total	Number mailed[b]	Number of responses	Response rate	Responses/ state total
I	47	47	21	45%	45%
II	31	15	7	47%	23%
III	136	96	31	32%	23%
IV	410	150	30	20%	7%
Total	636	308	89	29%	14%

Source: 1991 "Emerging Skill Needs" survey; 1987 Census of Manufacturers; 1989 Unemployment Insurance Name and Address File; 1989 Directory of Manufacturers; and various association and union membership lists.

[a] Firm types are as follows: Type I: large to very large printers with national and international markets; Type II: medium to large pre-press trade shops with advanced technology; Type III: medium-sized commercial printers with primarily regional markets; Type IV: small commercial or quick printers with very local markets, and five or more employees.

[b] Does not include questionnaires returned as undeliverable, or those returned unanswered.

Table I-3.
Response rate by VTAE District

VTAE District	Mailed*	Returned	Response rate (%)
Area District No. 4 (Madison)	38	12	32
Blackhawk	6	3	50
Chippewa Valley	9	1	11
Fox Valley	28	9	32
Gateway	24	7	29
Lakeshore	16	4	25
Mid-State	8	3	38
Milwaukee Area	81	18	22
Moraine Park	12	3	25
Nicolet	0	0	--
North Central	4	2	50
Northeast	17	7	41
Southwest	1	0	0
Waukesha County	43	14	32
Western	10	4	40
Wisconsin Indianhead	7	2	29

Source: 1991 "Emerging Skill Needs" survey; 1989 Unemployment Insurance Name and Address File.

* Does not include questionnaires returned as undeliverable or those returned unanswered.

WISCONSIN PRINTING INDUSTRY SKILLS SURVEY

Name: _____

Title: _____

Phone number: _____

Company: _____

Address: _____

_____

_____

1. What type of print shop is your company?
(please check one)
_____ Commercial
_____ Quick
_____ Trade shop
_____ Other--Please specify:_____

2a. Please describe your major products/processes:

_____

_____

_____

2b. For which products/processes do you subcontract?

_____

_____

_____

2c. What percent of your market is:
_____ Regional
_____ National
_____ International

3. In 1990, what was the average employment level in the following departments?
(number)

_____ Managerial
_____ Sales/customer service
_____ Prepress
_____ Press
_____ Bindery
_____ Other

4. What was your total employment in 1990?_____ In 1985?_____

5. Please estimate the average age, seniority, and percent female for employees in the following areas.

	Prepress	Press	Bindery	Entire Workforce
Average age				
Average tenure				
Percent female				

6. What percentage of employees in the following departments do you consider to be highly skilled?
(percentage)

_____ Prepress
_____ Press
_____ Bindery

7. In the last five years, has the general skill level of your workforce:
(please check one for each department)

	Prepress	Press	Bindery
Increased			
Remained the same			
Decreased			

8. Please provide estimates for the number of employees you expect to hire in 1991 in the following areas:

_____ Managerial
_____ Sales/customer service
_____ Clerical
_____ Prepress
_____ Press
_____ Bindery
_____ Other–Please specify:_____

9. Please indicate the number of employees that were hired, retired, quit, or were fired in 1990. *If you do not have exact numbers, please provide estimates. Employees that cannot be assigned to specific production departments (prepress, press, bindery) should be included in the total figures.*

	Prepress	Press	Bindery	Entire Workforce
Hired				
Retired				
Quit				
Fired				

10. Through which sources did your company hire employees in 1990?

Never Sometimes Often *(please check where appropriate)*

_____ _____ _____ Employee referral
_____ _____ _____ Technical college
_____ _____ _____ High school
_____ _____ _____ Association or union referral
_____ _____ _____ Employment service
_____ _____ _____ Newspaper ads
_____ _____ _____ Walk-in applicants
_____ _____ _____ Other--Please specify:_____

11. What kind of credentials do you look for (do you prefer) when you hire?

Never Sometimes Usually *(please check degree of importance)*

_____ _____ _____ High school diploma
_____ _____ _____ Apprenticeship training
_____ _____ _____ Technical college diploma
_____ _____ _____ Work experience in printing--Minimum years preferred:_____
_____ _____ _____ Work experience in other industries--Which industries?_____
_____ _____ _____ Bachelor's degree
_____ _____ _____ Other--Please specify:_____

12. What type of overall skill profile do you prefer for new employees?
(please check one)

_____ Basic skills
_____ General work experience outside of printing
_____ Broad, general knowledge of printing industry/processes
_____ Detailed knowledge of specific equipment/technologies

13. In general, does your company have difficulty:

a. hiring sufficiently skilled workers? _____ Yes _____ No
b. retaining sufficiently skilled workers? _____ Yes _____ No

14. What skills do you assess as most important for new production employees?

Less	Somewhat	Very *(please check degree of importance)*	
_____	_____	_____	Math skills
_____	_____	_____	Reading skills
_____	_____	_____	Computer knowledge
_____	_____	_____	Background in chemistry and physics
_____	_____	_____	Written expression
_____	_____	_____	Oral expression/communication skills
_____	_____	_____	Motivation
_____	_____	_____	General understanding of the industry
_____	_____	_____	Ability to adapt, learn new things
_____	_____	_____	Ability to follow instructions
_____	_____	_____	Capable of working in groups
_____	_____	_____	Able to work quickly, meet deadlines, handle stress
_____	_____	_____	Understanding of printing processes
_____	_____	_____	Knowledge of specific equipment

Please list any other important skills not mentioned above:

_____

_____

15. Please indicate the skills that you have found to be lacking among potential new production employees:
(please check all that apply)

_____ Math skills
_____ Reading skills
_____ Computer knowledge
_____ Background in chemistry and physics
_____ Written expression
_____ Oral expression/communication skills
_____ Motivation
_____ General understanding of the industry
_____ Ability to adapt, learn new things
_____ Ability to follow instructions
_____ Capable of working in groups
_____ Able to work quickly, meet deadlines, handle stress
_____ Understanding of printing processes
_____ Knowledge of specific equipment
_____ Other--Please specify:_____

16. On average, how many hours of formal orientation training is given to new production employees?
_____ Number of hours

17. On average, how many hours of formal training other than orientation is provided annually to production workers?
_____ Number of hours

18. What are your primary methods of training workers?

Never	Sometimes	Often	*(please check where appropriate)*
_____	_____	_____	Formal orientation for new hires
_____	_____	_____	Formal in-house training
_____	_____	_____	On-the-job
_____	_____	_____	Technical college courses
_____	_____	_____	Graphic Arts Institute courses
_____	_____	_____	Apprenticeship
_____	_____	_____	Equipment-vendor supplied
_____	_____	_____	Customized training--Please specify provider:_____
_____	_____	_____	Other--Please specify:_____

19. Has your company hired technical college graduates?

_____ Yes--Which colleges? _____
_____ No
_____ Do not know

20. If you have not hired technical college graduates, why not?

(please check all that apply)

_____ No technical college program in the region
_____ Do not know about technical college printing program
_____ Have not been able to attract/recruit technical college graduates
_____ Have never had the need: adequate supply of labor
_____ Do not want to hire: their training/qualifications do not match our needs
_____ Do not want to hire: too expensive
_____ Other--Please specify:_____

21. If you have hired technical college graduates, on average, were you satisfied with the their training?

_____ Yes, very satisfied
_____ Somewhat satisfied
_____ No, not satisfied
_____ Do not know

22. If you were not satisfied, why not?

(please check all that apply)

_____ Lack of basic reading, writing, math skills
_____ Lack of general industry knowledge
_____ Lack of specific skills on particular equipment/process--Please specify:_____
_____ Lack of motivation, social skills
_____ Other--Please specify:_____

23. In which areas does your firm place technical college graduates in printing?:

(please check all that apply)

_____ Managerial
_____ Sales/customer service
_____ Prepress
_____ Press
_____ Bindery
_____ Other--Please specify:_____

24. In which areas do you think that technical colleges could assist your training needs?
(please check all that apply)

_____ Increase the enrollment capacity of current programs
_____ Create new programs such as high-volume, flexo, screen, etc.
_____ On-site tutoring in basic reading and math skills
_____ On-site training in specific skills
_____ Customized training program at a technical college campus
_____ Other--Please specify:_____

25. Please estimate the percentage of your employees that have the following levels of education:

	Prepress	Press	Bindery	Entire Workforce
Less than high school				
High school				
Technical college				
Apprenticeship Certificate				
Bachelor's degree				
Higher than Bachelor's				

26. What percentage of your workforce is unionized? _____%

Which union(s)? _____

27. Which of the following best describes the organization of work in your company?
(please check one)

_____ Specific, detailed job classifications
_____ Multi-tasking
_____ Team centered

28. Has your company recently restructured its organization of work? _____ Yes _____ No

If so, when and why?_____

_____

29. How many different job classifications does your company have for:

a. skilled production workers? _____
b. semi-skilled production workers? _____
c. unskilled production workers? _____

30. **Describe your firms' equipment, particularly the extent of computerization and process control:**
(Please provide an equipment list if you have one available)

_____

_____

_____

31. Indicate to what extent you agree with the following statement:

"If our firm wants to remain competitive, it has to have the latest technology"

_____ Agree
_____ Agree to some extent
_____ Disagree

32. **Which of the following statements comes closest to your views:**
(please check either A or B and answer the corresponding follow-up question)

_____ A) To be able to operate our advanced equipment, a worker needs to have in-depth, specific knowledge in the latest printing technology.

If yes, can this knowledge only be gained through work experience with the same or similar equipment?

_____ Yes _____ No

_____ B) With today's rapidly changing technology, industry experience and industry-specific training are less important than a general understanding of complex production processes and a willingness to learn new techniques.

If yes, can these capacities be developed outside the industry?

_____ Yes _____ No

Appendix II.
Wages in the printing industry

The information available on the wages paid in this industry shows a confusing picture. Some sources indicate wages are high, while others suggest wages that are low enough as to be a detriment for firms in finding skilled workers. For example, according to the VTAE's 1988-89 Graduate Follow-up Report, the median monthly salary for graduates from the graphics programs is less than the median monthly salary for all Wisconsin industries and occupations, as well as less than the median monthly salary for all VTAE graduates (see Table 16). Some interviewees mentioned that the wages the VTAE graduates receive in the industry are barely higher than the wages unskilled entry-level workers receive. This is discouraging for the graduates, who have just paid for a year or two of schooling: "If people are going to invest in school, they need a higher starting wage" (Interview).

Several interviewees, including union, VTAE, and business representatives, mentioned that starting wages in the industry were low for all entry level workers. Interviewee comments include: "Traditionally the printing industry starts people off at low wages. The end wages are good, but it takes a while to move up"; "The industry really seems to want people to prove themselves before they will pay them decent wages"; and "The industry is not facing a shortage of skilled workers; rather, employers simply are not willing to pay the price. Wages have not been keeping up with inflation over the past five years, in both union and nonunion shops."

However, there were almost as many comments (again, by labor, the VTAE, and business) stating that wages were not a problem in the industry, and that, in fact, wages were especially good. One VTAE instructor noted that a lot of his students enroll in the printing program because of the high wages they can earn: "Grads can earn around $30,000 with overtime in their first year." Another interviewee noted that the "reason for the apparent shortage of skilled workers was not due to pay . . . We have a problem attracting quality people because the industry doesn't promote itself well."

Several data sources also indicate that wages in the industry are high. Information from the Department of Industry, Labor and Human Relations indicates that the average weekly earnings in printing, publishing, and allied products is much higher than the average for all manufacturing (see Table 17). This is probably because publishing, with a high proportion of professional workers, brings up the average wages.

The confusion regarding wages is probably related to the great diversity in firm types, occupations, and regions where printing firms are located. Most interviewees did agree that the wages for the skilled workers high on the job ladder were very good -- experienced press operators can earn up to $50,000 to $60,000 a year. It is also true that most entry level "factory-like" jobs do not pay well -- often only the minimum wage. This wage dispersion can be seen in Table II-1, which provides 1988 wage data for selected printing occupations. Weighted starting mean wages for production workers range from $4.56 an hour for bindery workers to $7.33 for lithographic photographers. As for the opportunity to earn high wages:

the highest paid screen makers earned $10.00 to $11.99 an hour, while the highest paid photographers and press operators earned $20.00 to $24.99 per hour. Interviewees noted that, traditionally, flexo press operators are paid the highest wages, while screen printers earn the lowest.

Table II-1.
Wage rates by selected printing industry occupations

Occupation	Mean hourly wage	Median hourly wage	Weighted starting mean wage	High wage category
Bindery worker	$6.50	$5.99	$4.56	12.00 to 13.99
Compositor-ad setup	7.46	7.13	5.18	16.00 to 17.99
Offset-platemaker	10.51	10.00	7.15	18.00 to 19.99
Offset-press operator	10.89	9.83	6.24	18.00 to 19.99
Photographer, lithographic	10.89	9.30	7.33	20.00 to 24.99
Phototypsetting specialist	8.11	7.50	5.64	14.00 to 15.99
Press operator	9.81	10.15	6.33	20.00 to 24.99
Printer	10.01	10.99	5.82	14.00 to 15.99
Screen maker	6.27	6.00	4.67	10.00 to 11.99
Screen printer	6.38	5.93	4.91	12.00 to 13.99
Web press operator	11.26	10.88	6.82	18.00 to 19.99

Source: Wisconsin Wage Survey, Department of Industry, Labor, and Human Resources, 1988.

Appendix III.
Glossary

Color separation Used to reproduce color. The original artwork is photographed using three filters, each corresponding on color and light transmission to one of three additive primary colors (blue, green, and red). The photograph taken with a red filter produces a positive with only blue and green, or cyan. The green filter creates a magenta positive, and the blue filter creates a yellow positive. Since the combination of these three colors does not produce an exact replica of the original, a fourth positive, black, is added to give the correct contrast of grays and shadows to reproduce all colors.

Desktop publishing Use of personal computers to digitally combine electronic typesetting and integration of boxers, lines, shapes, and other graphic images.

Electronic and ink-jet printing Pressureless and plateless process which use computers, electronics, electrostatics, and special toners to create images. Mostly used for functions such as addressing or billing.

Electronic scanning A method used for color separation and correction. The original is scanned with a light beam that is split into three beams after passing through the original. Each beam goes to a photocell covered with a filter that corresponds to one of the three additive primaries, and the image is reproduced digitally.

Film assembly (stripping) Negatives representing the printed images are taped into position on a sheet of plastic or colored paper, creating a flat. The stripper must check all negatives for things such as dimensions, ink register, positions, and layout.

Flexography A form of web letterpress using flexible rubber plates and fast-drying solvent or water-based inks. Can print on a wide range of materials, from toilet tissue to foils to plastics. Most commonly used for packaging.

Gravure A sunken or depressed image is etched onto a plate, and the wells are filled with ink. Its biggest advantage is in reproducing pictures, but since platemaking costs are high, it is usually only used for the highest quality, longer runs. Can be sheet-fed, or web-fed, which is called rotogravure.

Hand composition Typesetting by arranging individual metal characters, assembled into lines, on composing sticks. The appropriate spaces are entered to justify the line.

Heat-set The printed product is passed through a heating chamber which vaporizes the ink solvents. This prevents the ink from smearing and spreading.

Letterpress This is the oldest form of printing by moveable type. A relief surface is used, and the image is transferred onto the paper.

Lithography The most popular of all printing processes, lithography uses thin aluminum plates, onto which a greased image of the image to be printed is applied. The plate is covered with water, and then inked. The grease attracts the ink, while the water repels it. Can be sheet or web fed.

Offset A method of printing by transferring the image from the plate to a rubber blanket, and then from the blanket to the paper. This provides a softer impact, and therefore a cleaner image. Letterpress and gravure can use the offset process but the term has become synonymous with lithography, since most lithography is done in this way.

Platemaking This is the first area in which the process differs greatly for different printing processes. Images are transferred onto plates, or "image carriers," which are mounted onto presses. Plates can be made by the following methods: manual, mechanical, photomechanical, electromechanical, or electrostatic. Photomechanical, where the images are reproduced photographically, is the most common method.

Proofing The process of verifying that the printed colors are correct. Corrections are made and the work is reproofed.

Screen printing Formerly known as silk screen. Uses a porous screen mounted on a frame. A stencil is produced which allows the ink to soak through and create the image. Very versatile, can print surfaces such as wood, glass, textiles, and plastic.

Sheet-fed Printing on one sheet of paper at a time (versus web-fed).

Signature Sheets of paper which may contain 2 to 64 pages on each side, which are cut, folded, and assembled into a final printed product.

Typesetting Preparing text for printing. There are four kinds of typesetting: case metal or hot type composition, typewriter or strike-on composition, photographic typesetting, and electronic.

Web-fed Printing on rolls of paper that are later spliced into sheets.

Sources: International Paper, 1989; Marshall, 1983; Interviews.